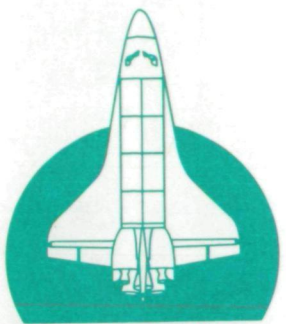




Earth Resources
A Continuing
Bibliography
with Indexes

NASA SP-7041 (27)
October 1980



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National Aeronautics and
Space Administration



Earth Resources
A Continuing Bibliography with Indexes

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EARTH RESOURCES

**A Continuing Bibliography
With Indexes
Issue 27**

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between July 1 and September 30, 1980 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*



Scientific and Technical Information Branch

National Aeronautics and Space Administration

Washington, DC

1980

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INTRODUCTION

The technical literature described in this continuing bibliography may be helpful to researchers in numerous disciplines such as agriculture and forestry, geography and cartography, geology and mining, oceanography and fishing, environmental control, and many others. Until recently it was impossible for anyone to examine more than a minute fraction of the earth's surface continuously. Now vast areas can be observed synoptically, and changes noted in both the earth's lands and waters, by sensing instrumentation on orbiting spacecraft or on aircraft.

This literature survey lists 337 reports, articles, and other documents announced between July 1 and September 30, 1980 in *Scientific and Technical Aerospace Reports (STAR)*, and *International Aerospace Abstracts (IAA)*.

The coverage includes documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches. It encompasses studies of such natural phenomena as earthquakes, volcanoes, ocean currents, and magnetic fields; and such cultural phenomena as cities, transportation networks, and irrigation systems. Descriptions of the components and use of remote sensing and geophysical instrumentation, their subsystems, observational procedures, signature and analyses and interpretive techniques for gathering data are also included. All reports generated under NASA's Earth Resources Survey Program for the time period covered in this bibliography will also be included. The bibliography does not contain citations to documents dealing mainly with satellites or satellite equipment used in navigation or communication systems, nor with instrumentation not used aboard aerospace vehicles.

The selected items are grouped in nine categories. These are listed in the Table of Contents with notes regarding the scope of each category. These categories were especially chosen for this publication, and differ from those found in *STAR* and *IAA*.

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations and abstracts are reproduced exactly as they appeared originally in *STAR*, or *IAA*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the variation in citation appearance.

Under each of the nine categories, the entries are presented in one of two groups that appear in the following order:

- IAA* entries identified by accession number series A80-10,000 in ascending accession number order;

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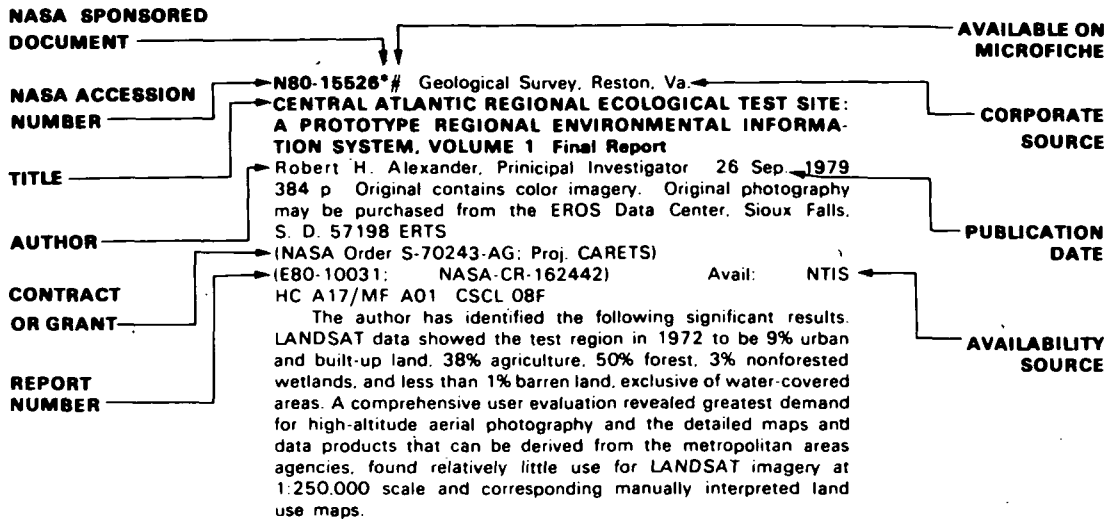
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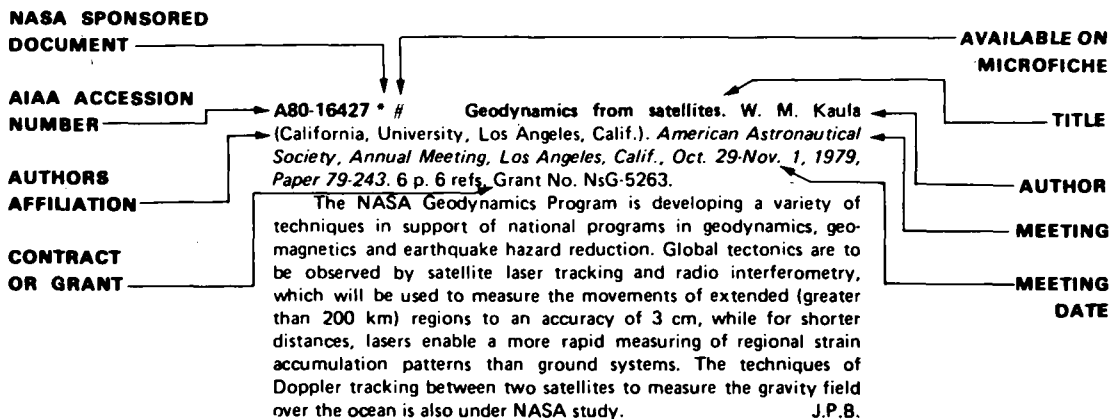
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EARTH RESOURCES

A Continuing Bibliography (Issue 27)

OCTOBER 1980

01

AGRICULTURE AND FORESTRY

Include crop forecasts, crop signature analysis, soil identification, disease detection, harvest estimates, range resources, timber inventory, forest fire detection, and wildlife migration patterns.

A80-34530 # Background survey of the operational utilization of remote sensing in agriculture (Van achtergrondsonderzoek tot operationeel gebruik van remote sensing in de landbouw). H. W. J. van Kasteren (Centrum voor Agrobiologisch Onderzoek, Wageningen, Netherlands). *Ruimtevaart*, vol. 29, Feb. 1980, p. 84-93. In Dutch.

A80-34538 * Global crop forecasting. R. B. MacDonald and F. G. Hall (NASA, Johnson Space Center, Houston, Tex.). *Science*, vol. 208, May 16, 1980, p. 670-679. 23 refs.

The needs for and remote sensing means of global crop forecasting are discussed, and key results of the Large Area Crop Inventory Experiment (LACIE) are presented. Current crop production estimates provided by foreign countries are shown often to be inadequate, and the basic elements of crop production forecasts are reviewed. The LACIE project is introduced as a proof-of-concept experiment designed to assimilate remote sensing technology, monitor global wheat production, evaluate key technical problems, modify the technique accordingly and demonstrate the feasibility of a global agricultural monitoring system. The global meteorological data, sampling and aggregation techniques, Landsat data analysis procedures and yield forecast procedures used in the experiment are outlined. Accuracy assessment procedures employed to evaluate LACIE technology performance are presented, and improvements in system efficiency and capacity during the three years of operation are pointed out. Results of LACIE estimates of Soviet, U.S. and Canadian wheat production are presented which demonstrate the feasibility and accuracy of the remote-sensing approach for global food and fiber monitoring. A.L.W.

A80-35297 * Airphoto analysis of erosion control practices. K. M. Morgan, D. R. Morris-Jones, G. B. Lee, and R. W. Kiefer (Wisconsin, University, Madison, Wis.). *Photogrammetric Engineering and Remote Sensing*, vol. 46, May 1980, p. 637-640. 8 refs. Research supported by the Wisconsin University; U.S. Environmental Protection Agency Grant No. G-005139-01; Grant No. NGL-50-002-127.

The Universal Soil Loss Equation (USLE) is a widely accepted tool for erosion prediction and conservation planning. In this study, airphoto analysis of color and color infrared 70 mm photography at a scale of 1:60,000 was used to determine the erosion control practice factor in the USLE. Information about contour tillage, contour strip cropping, and grass waterways was obtained from aerial photography for Pheasant Branch Creek watershed in Dane County, Wisconsin. (Author)

A80-38794 # Large space structures and the remote sensing of soil moisture (Le grandi strutture spaziali ed il telerilevamento dell'umidità del suolo). F. Graziani (Roma, Università, Rome, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 97-106. 24 refs. In Italian.

Techniques of remote sensing from large space structures for estimating soil moisture are surveyed. The advantages of microwave sensors include greater cloud cover transparency and their apparent maintenance of sensitivity to moisture variations in the presence of a crop canopy. Since spatial resolution for microwave sensors is limited by antenna size, however, the use of large space structures for minimizing the antenna restrictions are considered. Emphasis is placed on terrain roughness, the presence of vegetation and the depth of soil penetration, as well as infrared techniques. J.P.B.

A80-38800 # Applications of remote sensing in agriculture (Applicazioni del telerilevamento nel campo dell'agricoltura). F. Liguori (Consiglio Superiore dell'Agricoltura e Foreste, Rome, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 181-190. In Italian.

Prospects for applying remote sensing to agriculture are reviewed, considering the irrigation uses of water resources, the water balance, and Italian agriculture. Attention is given to agrarian and forest cultivation, hydrogeology, and the relation between the physical conditions of the vegetation and the productivity of various cultivation efforts. Also considered are the Tellus and UMUS projects, as well as the PAN project, wherein hydrologic balances are defined and evapotranspiration is measured. J.P.B.

A80-38802 # The European contribution to remote sensing in agriculture through the Ispra projects of the CCR (Il contributo Europeo al telerilevamento in agricoltura attraverso i progetti del CCR Ispra). S. Galli de Paratesi (EURATOM and Comitato Nazionale per l'Energia Nucleare, Centro Comune di Ricerche, Ispra, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 199-216. 29 refs. In Italian.

Remote sensing of agricultural resources is discussed, considering the AGRESTE and Tellus pilot projects. Attention is given to the identification, classification, and surface inventory of agro-forestal land, particularly of rice fields and poplar groves. Spectral characteristics of such objects are examined, taking into account varying degrees of fertilization and density; also discussed is an attempt to forecast production using radiometric data. J.P.B.

A80-38814 # Green and soil brightness indicators obtained through a Landsat data transformation procedure. A. Zandonella (Telespazio S.p.A., Rome, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 345-354. 7 refs.

A linear transformation method for the acquisition of green and soil brightness indicators from Landsat images is presented. The method is based on the structure of Landsat data in signal space, in which most of the spectral data of an agricultural region are so highly correlated that they lie in a V-shaped pattern of a plane in four-dimensional band space. Analysis of the physical basis of absorption and reflection signals in MSS bands 5 and 6 reveals one arm of the pattern to be associated with bare soil, while green vegetation lies along the other arm. Factorial analysis techniques can then be used to rotate the band space and obtain images correlated to green and soil indicators. The application of the technique to a test area is illustrated, and it is concluded that the analysis of data structure in a pictorial/geometric formulation may be used in the solution of agricultural problems. A.L.W.

A80-39739 Some significant results of a remote sensing experiment under European conditions /AGRESTE project/. A. Berg and S. Galli de Paratesi (EURATOM and Comitato Nazionale per L'Energia Nucleare, Centro Comune di Ricerche, Ispra, Italy). *International Journal of Remote Sensing*, vol. 1, Jan.-Mar. 1980, p. 3-9. 5 refs.

Selected results concerning northern Italian sites of the European AGRESTE project aimed at evaluating the applicability of remote sensing techniques to agriculture and forestry in Europe are presented. The identification of rice fields, poplar plantations and beech coppices was performed using supervised classification algorithms for Landsat imagery, allowing an estimation of the respective areas, and a multitemporal analysis was found to improve the classification accuracy relative to ground truth. In addition, relationships between the agronomical and radiometric characteristics in the four Landsat channels of rice were found to allow the estimation of yields before harvesting. A.L.W.

A80-39743 * Relationship of crop radiance to alfalfa agroeconomic values. C. J. Tucker (NASA, Goddard Space Flight Center, Earth Resources Branch, Greenbelt, Md.), J. H. Elgin, Jr., and J. E. McMurtrey, III (U.S. Department of Agriculture, Field Crops Laboratory, Beltsville, Md.). *International Journal of Remote Sensing*, vol. 1, Jan.-Mar. 1980, p. 69-75. 16 refs.

Red and photographic infrared spectral data of alfalfa were collected at the time of the third and fourth cuttings using a hand-held radiometer for the earlier alfalfa cutting. Significant linear and non-linear correlation coefficients were found between the spectral variables and plant height, biomass, forage water content, and estimated canopy cover. For the alfalfa of the later cutting, which had experienced a period of severe drought stress which limited growth, the spectral variables were found to be highly correlated with the estimated drought scores. (Author)

A80-39862 # The possibility of using soil reflectance spectra to study soil properties (Vozmozhnosti ispol'zovaniia spektrov otrazheniia pochv dlia izucheniia ikh svoistv). K. Ia. Kondrat'ev (Glavnaia Geofizicheskaiia Observatoriia, Leningrad, USSR) and P. P. Fedchenko (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Sel'skokhoziaistvennoi Meteorologii, Obninsk, USSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 114-124. 32 refs. In Russian.

The use of remotely sensed spectral reflectance data for soil recognition and soil mapping is reviewed. The possibility of using soil spectral brightness coefficients for soil mapping is considered; quantitative relationships between soil spectral reflectance and soil composition are examined. The proposed soil identification tech-

nique is illustrated by examples of the soil mapping of the Ukraine and Moldavia. B.J.

A80-40232 * Calibration procedures for measurement of reflectance factor in remote sensing field research. B. F. Robinson and L. L. Biehl (Purdue University, West Lafayette, Ind.). In: Measurements of optical radiations; Proceedings of the Seminar, San Diego, Calif., August 29, 30, 1979. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 16-26. 12 refs. Contracts No. NAS9-15466; No. NAS9-14970; No. NAS9-14016.

A means by which measurements of the optical properties of crops and soils can be knowledgeably compared from site to site and instrument to instrument is presented in detail. The definition of bidirectional reflectance factor is reviewed and discussed. Procedures for field implementation are illustrated and discussed. Spectral and goniometric properties of laboratory and field reference surfaces and typical environmental subjects serve as a basis for analysis of uncertainties introduced by differing illumination conditions. Results of a comparison of the performance of three spectrometer systems are presented and discussed. It is concluded that intelligent use of the bidirectional reflectance factor technique is an accurate and practical means to obtain the spectral, optical properties of crops and soils needed for advancements in agricultural remote sensing. (Author)

A80-41294 # Small-scale mapping of the post-fire dynamics of forests from aerial and space photographs (Melkomasshtabnoe kartirovanie poslepozharnoi dinamiki lesov po aerokosmicheskim snimkam). V. V. Furiaev (Akademiia Nauk SSSR, Institut Lesa i Drevesiny, Krasnoyarsk, USSR). *Issledovanie Zemli iz Kosmosa*, Mar.-Apr. 1980, p. 51-56. 18 refs. In Russian.

A method for studying the post-fire dynamics of forests on the basis of landscape and morphological analysis is described. It is shown that the landscape method of interpretation can be used for the detection and mapping of post-fire stages using aerial and space photographs. The preparation of post-fire maps of different scales is examined. B.J.

A80-41304 * The use of Landsat data to inventory cotton and soybean acreage in North Alabama. S. W. Downs, Jr. (NASA, Marshall Space Flight Center, Data Systems Laboratory, Huntsville, Ala.) and N. L. Faust (Georgia Institute of Technology, Atlanta, Ga.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 45-63.

This study was performed to determine if Landsat data could be used to improve the accuracy of the estimation of cotton acreage. A linear classification algorithm and a maximum likelihood algorithm were used for computer classification of the area, and the classification was compared with ground truth. The classification accuracy for some fields was greater than 90 percent; however, the overall accuracy was 71 percent for cotton and 56 percent for soybeans. The results of this research indicate that computer analysis of Landsat data has potential for improving upon the methods presently being used to determine cotton acreage; however, additional experiments and refinements are needed before the method can be used operationally. (Author)

A80-41305 * Issues arising from the demonstration of Landsat-based technologies to inventories and mapping of the forest resources of the Pacific Northwest states. D. L. Peterson and D. H. Card (NASA, Ames Research Center, Moffett Field, Calif.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 65-99. 13 refs.

A80-41307 * Application of remote sensing techniques to study southern pine beetles in the Georgia Piedmont. J. A. Biesbrock (North Georgia College, Dahlonega, Ga.) and S. W. Downs, Jr. (NASA, Marshall Space Flight Center, Data Systems Laboratory, Huntsville, Ala.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 115-128. 16 refs.

A80-41308 Forest cover mapping from Landsat imagery. A. J. Nash (Missouri-Columbia, University, Columbia, Mo.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 129-137.

Forest cover maps were produced for the 114 counties of Missouri by interpreting Landsat imagery. The original Landsat imagery was enlarged eight times to 1:125000 to equal the scale of the county maps. Forest cover was outlined on acetate overlays and then painted black to make a negative. A printing plate was made of each county and the forest cover was over-printed in light green on the county base map. To make a map of forest cover state-wide, a PMT print of each county at a scale of 1:500000 was made. The PMT's were then mosaicked together on a state base map and a negative and printing plate were made on the composite. The state-wide map shows forest cover in a light green overprint.

(Author)

A80-41309 Mapping hardwood forest defoliation by digital analysis of satellite data. G. R. Johnson (Technicolor Graphic Services, Inc., EROS Data Center, Sioux Falls, S.D.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 139-157. 13 refs. U.S. Geological Survey Contract No. 14-08-0001-16439.

The effectiveness of digital image analysis techniques is evaluated with regard to mapping the extent and severity of hardwood-forest canopy defoliation by the gypsy moth in the northeastern U.S. from Landsat MSS data and making geometrically corrected map overlays of known accuracy. An interactive procedure employing a clustering algorithm was used to develop training statistics to classify spectral data into nonforest and forest classes that include nondefoliated hardwood forest as well as light, moderate and heavy canopy defoliation. When all defoliation classes were grouped, the classification accuracy of Landsat results for defoliation was 70.2 plus or minus 5.2%, and overall grouped classification accuracy was 88.5 plus or minus 2.3%. It was thus shown that canopy defoliation could be identified and mapped from satellite data but defoliation severity levels could not be reliably identified.

J.P.B.

A80-41310 * Application of remote sensing to estimating soil erosion potential. D. R. Morris-Jones and R. W. Kiefer (Wisconsin, University, Madison, Wis.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 159-186. Grant No. NGL-50-002-127.

A variety of remote sensing data sources and interpretation techniques has been tested in a 6136 hectare watershed with agricultural, forest and urban land cover to determine the relative utility of alternative aerial photographic data sources for gathering the desired land use/land cover data. The principal photographic data sources are high altitude 9 x 9 inch color infrared photos at 1:120,000 and 1:60,000 and multi-date medium altitude color and color infrared photos at 1:60,000. Principal data for estimating soil erosion potential include precipitation, soil, slope, crop, crop practice, and land use/land cover data derived from topographic maps, soil maps, and remote sensing. A computer-based geographic information system organized on a one-hectare grid cell basis is used

to store and quantify the information collected using different data sources and interpretation techniques. Research results are compared with traditional Universal Soil Loss Equation field survey methods.

(Author)

A80-41312 Color and color infrared 70 mm aerial photography as a monitoring tool for assessing vegetation changes in a large freshwater wetland. S. L. Wynn and R. W. Kiefer (Wisconsin, University, Madison, Wis.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 199-227. Research supported by the Wisconsin Power and Light Co., Madison Gas and Electric Co., and Wisconsin Public Service Corp.; U.S. Environmental Protection Agency Grant No. R-803971-03.

A80-41543 * Complexities of nadir-looking radiometric temperature measurements of plant canopies. D. S. Kimes (NASA, Goddard Space Flight Center, Earth Resources Branch, Greenbelt, Md.), S. B. Idso, P. J. Pinter, Jr., R. D. Jackson, and R. J. Reginato (U.S. Department of Agriculture, Water Conservation Laboratory, Phoenix, Ariz.). *Applied Optics*, vol. 19, July 1, 1980, p. 2162-2168. 22 refs.

Effective radiant temperatures (ERTs) of five wheat canopies in different stages of development were measured during morning and noon periods. The observed variability in nadir sensor response was quantitatively described as a function of canopy structure and the vertical temperature profile of canopy components. In many cases, the nadir sensor ERT was a poor measure of vegetation temperature due to effects of soil emissions. Strong vertical temperature profiles of vegetation components were also observed. The theory and measurements presented document that remote measurements of vegetation canopy temperatures cannot be made indiscriminately over large spatial regions without consideration of the underlying physical principles.

(Author)

A80-41664 Photometric analysis of aerial photographs to detect and map sulfur dioxide effects of soybeans near two large, coal-fired power plants. C. D. Sapp (Tennessee Valley Authority, Air Quality Branch, Muscle Shoals, Ala.). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 9-27. 7 refs. U.S. Environmental Protection Agency Contract No. IAG-D6-E721.

A80-41666 Color infrared imagery as a management tool in the control of Dutch Elm Disease. L. F. Budd (Photographic Interpretation Corp., Hanover, N.H.). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 73-83. 9 refs.

A80-41675 Estimation of vegetation biomass in bunchgrass rangelands of Alberta using Landsat imagery. D. Jacques and J. Cihlar (Calgary, University, Calgary, Alberta, Canada). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 227-250. 19 refs. Research supported by the Department of Energy, Mines and Resources.

A80-41678 Applicability of Landsat imagery for mapping soils in arid and semi-arid regions. B. K. Worcester and K. J. Dalsted (South Dakota State University, Brookings, S. Dak.). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of

01 AGRICULTURE AND FORESTRY

Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 289-299. 13 refs.

The concept of soils as a continuum on the landscape and its relationship to Landsat imagery is presented. The USDA system of soil taxonomy is briefly discussed and its hierarchical nature is related to Landsat mapping scales. The need for careful, supporting field investigation is emphasized as it provides verification of soil classification and support for extrapolation of mapping results.

(Author)

A80-41679 * Influence of soils on Landsat spectral signatures of corn. K. J. Dalsted, B. K. Worcester, and M. E. DeVries (South Dakota State University, Brookings, S. Dak.). In: Remote sensing of earth resources. Volume B - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 301-314. 17 refs. Grant No. NGL-43-003-007. (SDSU-RSI-J-78-14)

Landsat data have been investigated extensively to determine crop types and acreage. However, confounding site factors have been found to reduce accuracy. Soils data in a small, contiguous area in southeast South Dakota were used to stratify Landsat data. A June 5 and July 29 CCT were used in a statistical analysis of corn training data. Significant soil parameters causing differences in study area soils were slope and parent material. Implication of the results is that, in this region, stratification of CCT data along parent material boundaries would improve corn classification accuracy. Research expanding on the interaction of soils and crops is both in progress and scheduled for additional studies in east central South Dakota.

(Author)

A80-41680 The relationship of soybean rust severity and yield to reflectance properties. P. S. Casey and L. W. Burgess (Sydney, University, Sydney, Australia). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 315-322. 13 refs. Research supported by the Commonwealth Scientific and Industrial Research Organization and U.S. Department of Agriculture.

A ground-based technique was used to measure the reflectance of a soybean canopy infected with rust. An Exotech radiometer which detects the radiance in four Landsat bandpasses was mounted on the bucket of an elevated travel tower. Disease severity was assessed on the ground at the same time at which the reflectance of the canopy was measured. The degree of association between the reflectance factor and disease severity was found to be highly significant in the four preselected bandpasses.

B.J.

N80-22756*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. **SURVEY OF METHODS FOR SOIL MOISTURE DETERMINATION**

T. J. Schmugge, T. J. Jackson (Dept. of Agriculture, Beltsville, Md.), and H. L. McKim (CRREL) Nov. 1979 76 p refs Presented at the Pecora Symp., Sioux Falls, S.D., Jun. 1979 Submitted for publication (NASA-TM-80658) Avail: NTIS HC A05/MF A01 CSCL 08M

Existing and proposed methods for soil moisture determination are discussed. These include: (1) in situ investigations including gravimetric, nuclear, and electromagnetic techniques; (2) remote sensing approaches that use the reflected solar, thermal infrared, and microwave portions of the electromagnetic spectrum; and (3) soil physics models that track the behavior of water in the soil in response to meteorological inputs (precipitation) and demands (evapotranspiration). The capacities of these approaches to satisfy various user needs for soil moisture information vary from application to application, but a conceptual scheme for merging these approaches into integrated systems to provide soil moisture information is proposed that has the potential for meeting various application requirements.

A.R.H.

N80-23210*# Scientific Systems, Inc., Cambridge, Mass. **WHEAT FORECAST ECONOMICS EFFECT STUDY Final Report**

R. K. Mehra, R. Rouhani, S. Jones, and I. Schick Washington NASA May 1980 117 p refs (Contract NAS5-25463)

(NASA-CR-3286) Avail: NTIS HC A06/MF A01 CSCL 05C

A model to assess the value of improved information regarding the inventories, productions, exports, and imports of crop on a worldwide basis is discussed. A previously proposed model is interpreted in a stochastic control setting and the underlying assumptions of the model are revealed. In solving the stochastic optimization problem, the Markov programming approach is much more powerful and exact as compared to the dynamic programming-simulation approach of the original model. The convergence of a dual variable Markov programming algorithm is shown to be fast and efficient. A computer program for the general model of multicountry-multiperiod is developed. As an example, the case of one country-two periods is treated and the results are presented in detail. A comparison with the original model results reveals certain interesting aspects of the algorithms and the dependence of the value of information on the incremental cost function.

M.G.

N80-23720*# Lockheed Electronics Co., Houston, Tex. **CROP PHENOLOGY LITERATURE REVIEW FOR CORN, SOYBEAN, WHEAT, BARLEY, SORGHUM, RICE, COTTON, AND SUNFLOWER**

T. Hodges and P. C. Doraiswamy, Principal Investigators Nov. 1979 90 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for Intern. Development ERTS (Contract NAS9-15800: Proj. AgRISTARS) (E80-10093; NASA-CR-160469; SR-L9-00409; LEC-13722; JSC-16088) Avail: NTIS HC A05/MF A01 CSCL 02C

N80-23721*# Fort Lewis A&M Coll., Durango, Colo. **DEVELOPMENT OF A WINTER WHEAT ADJUSTABLE CROP CALENDAR MODEL Final Report**

James R. Baker, Principal Investigator 31 Dec. 1979 83 p refs ERTS (Contract NAS9-15276) (E80-10094; NASA-CR-160447) Avail: NTIS HC A05/MF A01 CSCL 02C

The author has identified the following significant results. Least squares techniques were applied for parameter estimation of functions to predict winter wheat phenological stage with daily maximum temperature, minimum temperature, daylength, and precipitation as independent variables. After parameter estimation, tests were conducted using independent data. It may generally be concluded that exponential functions have little advantage over polynomials. Precipitation was not found to significantly affect the fits. The Robertson triquadratic form, in general use for spring wheat, yielded good results, but special techniques and care are required. In most instances, equations with nonlinear effects were found to yield erratic results when utilized with averaged daily environmental values as independent variables.

N80-23725*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

AGRICULTURAL SOIL MOISTURE EXPERIMENT: 1978 COLBY (KANSAS) DATA CATALOG AND DOCUMENTATION

B. W. Miltstead, Principal Investigator Sep. 1979 176 p refs ERTS (Contract NAS9-15800) (E80-10098; NASA-CR-160473; LEC-13226; JSC-16229) Avail: NTIS HC A09/MF A01 CSCL 02C

N80-23726*# Lockheed Engineering and Management Services Co. Inc., Houston, Tex.

VARIABILITY OF CROP CALENDAR STAGE DATES

M. L. Sestak, T. Hodges, and J. A. Artley, Principal Investigators Jan. 1980 23 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)
(E80-10099; NASA-CR-160468; LEMSCO-14070;
SR-LO-00416; JSC-16309) Avail: NTIS HC A02/MF A01
CSCL 02C

N80-23727*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

NATIONWIDE FORESTRY APPLICATIONS PROGRAM: CORRECTIONS TO FOREST REFLECTANCE AS A FUNCTION OF LOW SUN ANGLE AND SLOPE

W. H. Echert and C. E. Campbell, Principal Investigators Jun. 1979 36 p refs Sponsored in part by USDA ERTS

(Contract NAS9-15800)

(E80-10100; NASA-CR-160470; LEC-13188) Avail: NTIS HC A03/MF A01 CSCL 02F

N80-23730*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

LANDSAT RECONNAISSANCE IMAGES OF THE GREAT SOIL REGION IN THE WESTERN PART OF THE PARAIBA BASIN [RECONHECIMENTO DOS GRANDES DOMINIOS PEDOLOGICOS DA BACIA DO PARAIBA (PARTE OCIDENTAL) ATRAVES DE IMAGENS LANDSAT]

Nelson DeJesusParada, Principal Investigator, Mario Valerio Filho, Jose Pereira deQueirozNeto, Natalio Felipe Koffler, Paulo Nakashima, Juercio Tavares deMattos, Nilton Tocicazu Higa, and Vitor Celso deCarvalho Nov. 1979 55 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E80-10103; NASA-CR-162812; INPE-1623-RPE/088) Avail: NTIS HC A04/MF A01 CSCL 05B

N80-23731*# Purdue Univ., Lafayette, Ind.

SAMPLING FOR AREA ESTIMATION: A COMPARISON OF FULL-FRAME SAMPLING WITH THE SAMPLE SEGMENT APPROACH

Marilyn Hixson, Marvin E. Bauer, and Barbara J. Davis, Principal Investigators (Bell Telephone Co., Indianapolis) 1979 8 p refs Presented at the Machine Process. of Remotely Sensed Data Symp., 1979 ERTS

(Contract NAS9-14970)

(E80-10104; NASA-CR-160479; Rept-06277) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results. Full-frame classifications of wheat and non-wheat for eighty counties in Kansas were repetitively sampled to simulate alternative sampling plans. Evaluation of four sampling schemes involving different numbers of samples and different size sampling units shows that the precision of the wheat estimates increased as the segment size decreased and the number of segments was increased. Although the average bias associated with the various sampling schemes was not significantly different, the maximum absolute bias was directly related to sampling size unit.

N80-23732*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

EVALUATION OF SEVERAL SCHEMES FOR CLASSIFICATION OF REMOTELY SENSED DATA: THEIR PARAMETERS AND PERFORMANCE

Donna Scholz, Nancy Fuhs, Marilyn Hixson, and Tsuyoshi Akiyama, Principal Investigators 1979 14 p refs ERTS

(Contract NAS9-15466)

(E80-10105; NASA-CR-160478; LARS-TR-041279) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results. Data sets for corn, soybeans, winter wheat, and spring wheat were used to evaluate the following schemes for crop identification: (1) per point Gaussian maximum classifier; (2) per point sum of normal densities classifiers; (3) per point linear classifier; (4) per point Gaussian maximum likelihood decision tree classifiers; and (5) texture sensitive per field Gaussian maximum likelihood classifier. Test site location and classifier both had significant effects on classification accuracy of small grains; classifiers did not differ significantly in overall accuracy, with the majority of the difference among classifiers being attributed to training method

rather than to the classification algorithm applied. The complexity of use and computer costs for the classifiers varied significantly. A linear classification rule which assigns each pixel to the class whose mean is closest in Euclidean distance was the easiest for the analyst and cost the least per classification.

N80-23738*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

THE APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE SOLUTION OF PROBLEMS IN THE MANAGEMENT OF RESOURCES IN INDIANA Semiannual Status Report, 1 Dec. 1978 - 31 May 1979

R. A. Weismiller and R. P. Mrocznski, Principal Investigators 31 May 1979 32 p refs ERTS

(Grant NGL-15-005-186)

(E80-10111; NASA-CR-162853; LARS-053079) Avail: NTIS HC A03/MF A01 CSCL 05A

N80-23739*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

APPLICABILITY OF SELECTED WHEAT REMOTE SENSING TECHNOLOGY TO CORN AND SOYBEANS Final Report, 1 Nov. 1978 - 30 Nov. 1979

Quentin A. Holmes, William A. Malila, Principal Investigators, D. P. Rice, and E. P. Crist Jan. 1980 38 p refs ERTS

(Contract NAS9-15082)

(E80-10112; NASA-CR-160546; ERIM-124000-9-F) Avail: NTIS HC A03/MF A01 CSCL 02C

N80-23740*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

AGRICULTURAL SCENE UNDERSTANDING AND SUPPORTING FIELD RESEARCH, VOLUME 1 Final Report, 1 Dec. 1978 - 30 Nov. 1979

D. A. Landgrebe, Principal Investigator, M. E. Bauer, L. L. Biehl, C. S. T. Daughtry, B. F. Robinson, and E. R. Stover Nov. 1979

140 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development. ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E80-10113; NASA-CR-160547; SR-P9-00410;

LARS-112879) Avail: NTIS HC A07/MF A01 CSCL 02C

N80-23741*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

PROCESSING TECHNIQUES DEVELOPMENT, VOLUME 2. PART 1: CROP INVENTORY TECHNIQUES Final Report, 1 Dec. 1978 - 30 Nov. 1979

D. A. Landgrebe, Principal Investigator, C. S. T. Daughtry, and M. M. Hixson Nov. 1979 76 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E80-10114; NASA-CR-160548; SR-P9-00411;

LARS-112979) Avail: NTIS HC A05/MF A01 CSCL 02C

N80-23742*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

PROCESSING TECHNIQUES DEVELOPMENT, VOLUME 3. PART 2: DATA PREPROCESSING AND INFORMATION EXTRACTION TECHNIQUES Final Report, 1 Dec. 1978 - 30 Nov. 1979

D. A. Landgrebe, Principal Investigator, P. H. Swain, P. E. Anuta, and H. J. Siegel Nov. 1979 155 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development. Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E80-10115; NASA-CR-160549; SR-P9-00412;

LARS-113079) Avail: NTIS HC A08/MF A01 CSCL 05B

N80-23743*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

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COMPUTER PROCESSING SUPPORT, VOLUME 4 Final Report, 1 Dec. 1978 - 30 Nov. 1979

D. A. Landgrebe, Principal Investigator, J. L. Kast, L. A. Kraemer, B. M. Shelley, S. K. Schwingendorf, and T. L. Phillips Nov. 1979 136 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for Intern. Development ERTS
(Contract NAS9-15466; Proj. AgRISTARS)
(E80-10116; NASA-CR-160550; SR-P9-00413; LARJ-120179) Avail: NTIS HC A07/MF A01 CSCL 02C

N80-23744*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

CORN/SOYBEAN DECISION LOGIC: IMPROVEMENTS AND NEW CROPS

C. L. Dailey, K. M. Abotteen, and J. D. Nichols, Principal Investigators Jan. 1980 91 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E80-10118; NASA-CR-160543; FC-Lo-00420; LEMSCO-14084; JSC-16301) Avail: NTIS HC A05/MF A01 CSCL 02C

N80-23745*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

INTERPRETATION OF LANDSAT DIGITAL DATA USING A CUBIC COLOR MODEL BASED ON RELATIVE ENERGIES

R. B. Cate, D. E. Phinney, M. C. Kinsler, M. L. Sestak, T. Hodges, and J. J. Dishler, Principal Investigators Feb. 1980 31 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E80-10119; NASA-CR-160541; SR-LO-00418; LEMSCO-13499) Avail: NTIS HC A03/MF A01 CSCL 05B

N80-23746*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

NEUTRON-METER CALIBRATION FOR THE 1978 COLBY SOIL MOISTURE EXPERIMENT

Lalit M. Arya, Principal Investigator Feb. 1980 37 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E80-10120; NASA-CR-160553; SR-LO-00415; LEMSCO-14082; JSC-13775) Avail: NTIS HC A03/MF A01 CSCL 08M

N80-23747*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

COMPOSITION AND ASSEMBLY OF A SPECTRAL DATA BASE FOR TRANSITION YEAR SPRING WHEAT BLIND SITES

M. H. Trenchard, M. L. Sestak, and M. C. Kinsler, Principal Investigators Jan. 1980 114 p ref Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E80-10121; NASA-CR-160544; SR-LO-00417; LEMSCO-14069; JSC-16273) Avail: NTIS HC A06/MF A01 CSCL 02C

N80-23748*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

CROP YIELD LITERATURE REVIEW FOR AGRISTARS CROPS: CORN, SOYBEANS, WHEAT, BARLEY, SORGHUM, RICE, COTTON, AND SUNFLOWERS

P. C. Doraiswamy, T. Hodges, and D. E. Phinney, Principal Investigators Dec. 1979 106 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E80-10122; NASA-CR-160542; SR-L9-00405; LEC-13791; JSC-16320) Avail: NTIS HC A06/MF A01 CSCL 02C

N80-25741*# Canada Centre for Remote Sensing, Ottawa (Ontario).

HCMM: SOIL MOISTURE EXPERIMENT Progress Report

Josef Cihlar, Principal Investigator 30 Apr. 1980 4 p Sponsored by NASA HCMM
(E80-10166; NASA-CR-163183) Avail: NTIS HC A02/MF A01 CSCL 08M

N80-26713*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

MICROWAVE REMOTE SENSING OF SOIL MOISTURE CONTENT OVER BARE AND VEGETATED FIELDS 3

J. R. Wang, J. C. Shiue, and J. E. McMurtrey, III, Principal Investigators (Agr. Res. Center, Beltsville, Md.) Mar. 1980 16 p refs Submitted for publication ERTS
(E80-10123; NASA-TM-80669) Avail: NTIS HC A02/MF A01 CSCL 08M

The author has identified the following significant results. Ground truth of soil moisture content, and ambient air and soil temperatures were acquired concurrently with measurements of soil moisture in bare fields and fields covered with grass, corn, and soybeans obtained with 1.4 GHz and 5 GHz radiometers mounted on a truck. The biomass of the vegetation was sampled about once a week. The measured brightness temperatures over the bare fields were compared with those of radiative transfer model calculations using as inputs the acquired soil moisture and temperatures data with appropriate values of dielectric constants for soil-water mixtures. A good agreement was found between the calculated and measured results over 10 deg to 70 deg incident angles. The presence of vegetation reduced the sensitivity of soil moisture sensing. At 1.4 GHz the sensitivity reduction ranged from about 20% for 10 cm tall grassland cover to over 50 to 60% for the dense soybean field. At 5 GHz corresponding reduction in sensitivity ranged from approximately 70% to approximately 90%.

N80-26716*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

CONTEXTUAL CLASSIFICATION OF MULTISPECTRAL IMAGE DATA

P. H. Swain, S. B. Vardeman, and J. C. Tilton, Principal Investigator 10 Jan. 1980 39 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15466; Grant NSF MCS-78-04366; Proj. AgRISTARS)
(E80-10126; NASA-CR-160587; SR-PO-00443; LARS-TR-011080) Avail: NTIS HC A03/MF A01 CSCL 02C

N80-26717*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

MONITORING FOREST CANOPY ALTERATION AROUND THE WORLD WITH DIGITAL ANALYSIS OF LANDSAT IMAGERY

Darrel L. Williams and Lee D. Miller, Principal Investigator (Texas A and M Univ., College Station) Aug. 1979 46 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E80-10127; NASA-TM-80761) Avail: NTIS HC A03/MF A01 CSCL 02F

N80-26718*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

EVALUATION OF TRANSITION YEAR CANADIAN TEST SITES

R. W. Payne, Principal Investigators Apr. 1980 36 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior

and Agency for International Development ERTS
(Contract NAS9-15800: Proj. AgRISTARS)
(E80-10128; NASA-CR-160655; FC-LO-00422;
LEMSCO-14320; JSC-16338) Avail: NTIS HC A03/MF A01
CSCL 02C

The author has identified the following significant results.
The spring small grain proportion accuracy in 15 Saskatchewan
test sites was found to be comparable to that of the Large
Area Crop Inventory Experiment Phase 3 and Transition Year
results in the U.S. spring wheat states. Spring small grain labeling
accuracy was 94%, and the direct wheat labeling accuracy was
89%, despite the low barley separation accuracy of 30%.

N80-26719*# Kansas Univ. Center for Research, Inc., Lawrence.
Remote Sensing Lab.

**SOIL TEXTURAL EFFECTS ON RADAR RESPONSE TO SOIL
MOISTURE**

Fawwaz T. Ulaby, Principal Investigator and M. C. Dobson Oct.
1979 240 p refs ERTS
(Contract NAS9-14052)

(E80-10131; NASA-CR-160585; RSL-TR-264-30) Avail: NTIS
HC A11/MF A01 CSCL 08M

N80-26721*# Purdue Univ., Lafayette, Ind. Lab. for Applications
of Remote Sensing.

**PHYSIOCHEMICAL, SITE, AND BIDIRECTIONAL REFLEC-
TANCE FACTOR CHARACTERISTICS OF UNIFORMLY
MOIST SOILS**

Eric R. Stoner and Marion F. Baumgardner, Principal Investigator
Feb. 1980 104 p refs Sponsored by NASA, USDA, Dept. of
Commerce, Dept. of Interior and Agency for International
Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)
(E80-10134; NASA-CR-160571; SR-PO-00431;
LARS-TR-11679) Avail: NTIS HC A06/MF A01 CSCL 02C

The author has identified the following significant results.
The bidirectional reflectance factor (0.5 micron to 2.3 micron
wavelength interval) and physiochemical properties of over
500 soils from 39 states, Brazil and Spain were measured. Site
characteristics of soil temperature regime and moisture zone were
used as selection criteria. Parent material and internal drainage
were noted for each soil. At least five general types of soil
reflectance curves were identified based primarily on the presence
or absence of ferric iron absorption bands, organic matter
content, and soil drainage characteristics. Reflectance in 10 bands
across the spectrum was found to be negatively correlated with
the natural log of organic matter content.

N80-26722*# Purdue Univ., Lafayette, Ind. Lab. for Applications
of Remote Sensing.

**FOREST RESOURCE INFORMATION SYSTEM, PHASE 3
Quarterly Report, 1 Oct. - 31 Dec. 1979**

R. P. Mroczynski, Principal Investigator, F. E. Goodrick, S.
Schwingendorf, B. Shelley, D. Freeman, C. Kozlowski, C. Smith,
and C. Peterson 20 Jan. 1980 65 p ERTS
(Contract NAS9-15325)

(E80-10135; NASA-CR-160570; LARS-CR-012080) Avail:
NTIS HC A04/MF A01 CSCL 20F

N80-26723*# Purdue Univ., Lafayette, Ind. Lab. for Applications
of Remote Sensing.

**CONTEXT DISTRIBUTION ESTIMATION FOR CONTEXTUAL
CLASSIFICATION OF MULTISPECTRAL IMAGE DATA**

J. C. Tilton, P. H. Swain, and S. B. Vardeman, Principal Investigator
Apr. 1980 12 p refs Sponsored by NASA, USDA, Dept. of
Commerce, Dept. of Interior and Agency for International
Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)
(E80-10136; NASA-CR-160588; SR-PO-00444;
LARS-TR-040280) Avail: NTIS HC A02/MF A01 CSCL 02C

N80-26733*# Telespazio, S.p.A., Rome (Italy).

**GREEN AND SOIL BRIGHTNESS INDICATORS OBTAINED
THROUGH A LANDSAT DATA TRANSFORMATION
PROCEDURE**

Angelo Zandonella, Principal Investigator 1980 11 p refs
Presented at the 27th Rass. Intern. Elettronica Nucl. ed
Aerospaziale, Rome, 7-16 Mar. 1980 and the 20th Convegno
sullo Spazio, Rome, 11-13 Mar. 1980 Sponsored by NASA
Original contains imagery. Original photography may be purchased
from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E80-10146; NASA-CR-163164) Avail: NTIS
HC A02/MF A01 CSCL 14E

N80-26735*# Lockheed Engineering and Management Services
Co., Inc., Houston, Tex.

**LABEL IDENTIFICATION FROM STATISTICAL TABULA-
TION (LIST) TEMPORAL EXTENDABILITY STUDY**

T. B. Dennis, Principal Investigator Feb. 1980 37 p refs
Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior
and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)
(E80-10148; NASA-CR-160563; SR-LO-00424;
LEMSCO-14278; JSC-16334) Avail: NTIS HC A03/MF A01
CSCL 02C

The author has identified the following significant results.
The most apparent contributors to the problem of poor temporal
extension of LIST are the drastic changes in the brightness keys
and an inadequate set of AI responses in Phase 3. The brightness
trajectories change drastically from Phase 3 to the transition
year (TY). Removing brightness channels from the discriminant
does not completely correct the lack of extendability. Removing
brightness increases the accuracy of the extension from
Phase 3 to TY from 57.7 percent to 64.18 percent. The removal
of the AI keys increases accuracy to 65.76 percent. Although
the latter increase appears insignificant when compared to the
first, the removal of only the AI keys increased accuracy to
63.58 percent. Proper weighting of the responses explains 73.8
percent of the ground truth labels but only 56.7 percent of the
AI labels. By contrast, the TY responses which were weighted
to explain the TY ground truth labels fared equally well, explaining
73.6 percent of those labels and 87.1 percent of the AI labels.

N80-26740*# Texas A&M Univ., College Station. Remote
Sensing Center.

**DRYLAND PASTURE AND CROP CONDITIONS AS SEEN
BY HCMM Progress Report**

W. D. Rosenthal, J. C. Harlan, and Bruce J. Blanchard, Principal
Investigator Feb. 1980 24 p Original contains imagery. Original
imagery may be purchased from NASA Goddard Space Flight
Center, (code 601), Greenbelt, Md. 20771. Domestic users
send orders to 'Attn: National Space Science Data Center';
non-domestic users send orders to 'Attn: World Data Center A
for Rockets and Satellites'. HCMM

(Contract NAS5-24383)
(E80-10157; NASA-CR-163174; PR-3712-8) Avail: NTIS
HC A02/MF A01 CSCL 02C

N80-26741*# Dartmouth Coll., Hanover, N.H.

**AN INVESTIGATION OF VEGETATION AND OTHER EARTH
RESOURCE/FEATURE PARAMETERS USING LANDSAT
AND OTHER REMOTE SENSING DATA. A: LANDSAT.
B: REMOTE SENSING OF VOLCANIC EMISSIONS
Semiannual Status Report, 1 Jul. - 31 Dec. 1979**

Richard W. Birnie, Richard E. Stoiber, Principal Investigator, Emily
Bryant, A. G. Dodge, Ken Sutherland, Joseph Francica, and
Lawrence Malinconico 31 Dec. 1979 27 p ERTS

(Grant NSG-5014)
(E80-10158; NASA-CR-163177) Avail: NTIS
HC A03/MF A01 CSCL 08F

N80-26742*# Montana Univ., Missoula. Wildlife-Wildlands
Inst.

**GRIZZLY BEAR HABITAT ANALYSIS. SECTION 2:
EVALUATION OF GRIZZLY BEAR FOOD PLANTS, FOOD
CATEGORIES AND HABITAT**

01 AGRICULTURE AND FORESTRY

John J. Craighead and Jay S. Sumner, Principal Investigator
1980 172 p refs Sponsored by NASA ERTS
(E80-10159: NASA-CR-163175) Avail: NTIS
HC A08/MF A01 CSCL 08F

N80-27099# International Training Centre for Aerial Survey,
Enschede (Netherlands).

DIGITAL IMAGE PROCESSING OF SATELLITE PHOTOGRAPHS [DIGITALE BEELDVERWERKING VAN SATELLIET OPNAMEN]

Nico H. W. Donker. In Amsterdam Univ. The Computer in
Phys. Geograph. 1979 p 35-61 refs In DUTCH

Avail: NTIS HC A06/MF A01

The significance of remote sensing for developing countries is emphasized, and some applications mentioned, using LANDSAT data in particular. Also discussed are digital imagery, geometric and radiometric corrections, and automatic classification of soil cover using multispectral data. Author (ESA)

N80-27565# Army Engineer Topographic Labs., Fort Belvoir, Va.

BACKSCATTERING OF ELECTROMAGNETIC WAVES FROM A LAYER OF VEGETATION

Richard A. Hevenor 15 Feb. 1980 29 p refs
(AD-A083922: ETL-R008) Avail: NTIS HC A03/MF A01 CSCL 17/9

A theoretical model for the backscattering of electromagnetic waves from a layer of vegetation is obtained using a first order renormalization technique to determine volume scattering. The vegetation soil interface is assumed rough according to the tangent plane approximation and the scattering from this boundary is added incoherently to the volume scattering result. The mean wave in the vegetation is obtained using a bilocal approximation of the Dyson's equation. A free space dyadic Green's function is used along with a correlation function of the dielectric fluctuations which is exponential in form and which also possess different correlation lengths l_x , l_y , and l_z in the x , y , and z , directions. Effective propagation constants are obtained for both horizontal and vertical polarizations. The scattered wave is solved for using a two dimensional Fourier transform technique and the boundary conditions at either end of the vegetation layer are matched. The far field backscatter coefficients are computed for both horizontal and vertical polarizations. The mean and variance of the dielectric fluctuations are calculated with the aid of Peake's model for the dielectric constant of vegetation. The theory is matched to experimental data taken from a corn field. The resulting values for the correlation parameters are then used to monitor the growth pattern of the corn field over a period of time. Comparison between the theoretical and experimental results over this time period are shown. The theory is also matched to experimental data from spring and fall deciduous trees. GRA

N80-27764*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

LABEL IDENTIFICATION FROM STATISTICAL TABULATION (LIST)

T. B. Dennis, Principal Investigator Mar. 1980 18 p refs
Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15800: Proj. AgRISTARS)
(E80-10132: NASA-CR-160584: SR-LO-00430;
LEMSCO-14390: JSC-16345) Avail: NTIS HC A02/MF A01 CSCL 02C

N80-27765*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

ON THE ACCURACY OF PIXEL RELAXATION LABELING

D. A. Landgrebe, Principal Investigator, J. A. Richards, and P. H. Swain Mar. 1980 34 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15466: Proj. AgRISTARS)
(E80-10185: NASA-CR-160691: SR-PO-00455;
LARS-TR-030180) Avail: NTIS HC A03/MF A01 CSCL 05B

N80-27766*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

DATA RESOLUTION VERSUS FORESTRY CLASSIFICATION

Edwin P. F. Kan and David L. Ball, Principal Investigators Dec. 1974 34 p refs Sponsored in part by USDA ERTS
(Contract NAS9-12200)
(E80-10189: NASA-CR-160610) Avail: NTIS
HC A03/MF A01 CSCL 05B

N80-27767*# Environmental Research Inst. of Michigan, Ann Arbor.

ANALYSIS OF SCANNER DATA FOR CROP INVENTORIES Quarterly Progress Report, 16 Feb. - 15 May 1980

Robert Horvath, R. Cicone, E. Crist, R. Kauth, and W. Pont, Principal Investigators May 1980 142 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Contract NAS9-15476: Proj. AgRISTARS)
(E80-10191: NASA-CR-160692: ERIM-132400-40-P) Avail: NTIS HC A07/MF A01 CSCL 05B

N80-27769*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

FINAL DESIGN SPECIFICATION FOR LARSYS/ISOCLS MODIFICATION FOR LACIE PHASE 3

B. F. Wills, Principal Investigator Feb. 1977 70 p ERTS
(Contract NAS9-12200)
(E80-10212: NASA-CR-160612: LEC-10161: JSC-12542) Avail: NTIS HC A04/MF A01 CSCL 05B

N80-27770*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

TRANSFER OF INTERACTIVE REPORT EXTRACTED DATA (TIRED) REQUIREMENTS SPECIFICATION

Kenneth L. Pattison, Principal Investigator Jun. 1976 10 p ERTS
(Contract NAS9-12200)
(E80-10219: NASA-CR-160615: LEC-8841: JSC-11365) Avail: NTIS HC A02/MF A01 CSCL 05B

N80-27771*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

TRANSFER OF INTERACTIVE REPORT EXTRACTED DATA (TIRED) REQUIREMENTS SPECIFICATION

Kenneth L. Pattison, Principal Investigator Jun. 1976 10 p ERTS
(Contract NAS9-12200)
(E80-10221: NASA-CR-160611: LEC-8841-Rev-A;
JSC-11365-Rev-A) Avail: NTIS HC A02/MF A01 CSCL 05B

N80-27772*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

PDP 11/45 LACIE PHASE 11/111 AUTOMATIC STATUS AND TRACKING SYSTEM FUNCTIONAL DESIGN SPECIFICATION

J. M. Everette and D. L. Smith, Principal Investigators Nov. 1976 53 p ERTS
(Contract NAS9-12200)
(E80-10222: NASA-CR-160613: LEC-9861: JSC-11835) Avail: NTIS HC A04/MF A01 CSCL 02C

N80-27774*# Lockheed Electronics Co., Houston, Tex. SCREWORM ERADICATION DATA SYSTEM, PHASE 2 PROJECT PLAN: FIELD TESTS

Aug. 1975 15 p ERTS
(Contract NAS9-12200)
(E80-10225: NASA-CR-160616: LEC-6473: JSC-09825) Avail: NTIS HC A02/MF A01 CSCL 08C

N80-27780*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

REMOTE SENSING OF SOIL MOISTURE CONTENT OVER BARE FIELDS AT 1.4 GHz FREQUENCY

J. R. Wang and B. J. Choudhury (Computer Sciences Corp., Silver Spring, Md.) Jun. 1980 26 p refs Submitted for publication
(NASA-TM-80711) Avail: NTIS HC A03/MF A01 CSCL 08M

A simple method of estimating moisture content (W) of a bare soil from the observed brightness temperature ($T_{\text{sub B}}$) at 1.4 GHz is discussed. The method is based on a radiative transfer model calculation, which has been successfully used in the past to account for many observational results, with some modifications to take into account the effect of surface roughness. Besides the measured $T_{\text{sub B}}$'s, the three additional inputs required by the method are the effective soil thermodynamic temperature, the precise relation between W and the smooth field brightness temperature $T_{\text{sub B}}$ and a parameter specifying the surface roughness characteristics. The soil effective temperature can be readily measured and the procedures of estimating surface roughness parameter and obtaining the relation between W and smooth field brightness temperature are discussed in detail. Dual polarized radiometric measurements at an off-nadir incident angle are sufficient to estimate both surface roughness parameter and W , provided that the relation between W and smooth field brightness temperature at the same angle is known. The method of W estimate is demonstrated with two sets of experimental data, one from a controlled field experiment by a mobile tower and the other, from aircraft overflight. The results from both data sets are encouraging when the estimated W 's are compared with the acquired ground truth of W 's in the top 2 cm layer. An offset between the estimated and the measured W 's exists in the results of the analyses, but that can be accounted for by the presently poor knowledge of the relationship between W and smooth field brightness temperature for various types of soils. An approach to quantify this relationship for different soils and thus improve the method of W estimate is suggested.

L.F.M.

ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis, urban and metropolitan studies, environmental impact, air and water pollution, geographic information systems, and geographic analysis.

A80-35302 * Utilizing LANDSAT imagery to monitor land-use change - A case study in Ohio. S. I. Gordon (Ohio State University, Columbus, Ohio). *Remote Sensing of Environment*, vol. 9, May 1980, p. 189-196. 9 refs. Research supported by the U.S. Department of Housing and Urban Development; Contract No. NAS5-22399.

A study, performed in Ohio, of the nature and extent of interpretation errors in the application of Landsat imagery to land-use planning and modeling is reported. Potential errors associated with the misalignment of pixels after geometric correction and with misclassification of land cover or land use due to spectral similarities were identified on interpreted computer-compatible tapes of a portion of Franklin County for two adjacent days of 1975 and one day of 1973, and the extents of these errors were quantified by comparison with a ground-checked set of aerial-photograph interpretations. The open-space and agricultural categories are found to be the most consistently classified, while the more urban areas were classified correctly only from about 43 to 8% of the time. It is thus recommended that the direct application of Landsat data to land-use planning must await improvements in classification techniques and accuracy.

A.L.W.

A80-35303 * Remote sensing and spectral analysis of plumes from ocean dumping in the New York Bight Apex. R. W. Johnson (NASA, Langley Research Center, Hampton, Va.). *Remote Sensing of Environment*, vol. 9, May 1980, p. 197-209. 20 refs.

The application of the remote sensing techniques of aerial photography and multispectral scanning in the qualitative and quantitative analysis of plumes from ocean dumping of waste materials is investigated in the New York Bight Apex. Plumes resulting from the dumping of acid waste and sewage sludge were observed by Ocean Color Scanner at an altitude of 19.7 km and by Modular Multispectral Scanner and mapping camera at an altitude of 3.0 km. Results of the qualitative analysis of multispectral and photographic data for the mapping, location, and identification of pollution features without concurrent sea truth measurements are presented which demonstrate the usefulness of in-scene calibration. Quantitative distributions of the suspended solids in sewage sludge released in spot and line dumps are also determined by a multiple regression analysis of multispectral and sea truth data.

A.L.W.

A80-35746 # Remote sensing applications to wind power facility siting. C. L. Rosenfeld and P. A. Maule (Oregon State University, Corvallis, Ore.). In: Conference and Workshop on Wind Energy Characteristics and Wind Energy Siting, Portland, Ore., June 19-21, 1979, Proceedings. Boston, Mass., American Meteorological Society, 1979, p. 375-379.

The application of remote sensing techniques to the assessment of potential wind power sites according to various indicators is discussed. The key wind-power indicators are grouped as vegetation, snow covers, eolian features and topoclimatic indicators, and each group is matched with appropriate sensing platforms and parameters to be used in regional assessment, area evaluation and specific site selection. Procedures for initial regional-scale screening based on regional wind field data and satellite imagery and high-altitude aerial

photographs and for medium-scale evaluation based on vertical aerial photography supplied by various agencies and unconventional photointerpretation techniques such as vegetation deformation and electronic image processing are examined. Aerial or field reconnaissance efforts are then presented as appropriate means for the verification of specific candidate sites for wind instrumentation.

A.L.W.

A80-36470 * A survey of light-scattering techniques used in the remote monitoring of atmospheric aerosols. D. Deirmendjian (Rand Corp., Santa Monica, Calif.). *Reviews of Geophysics and Space Physics*, vol. 18, May 1980, p. 341-360. 165 refs. Contract No. NAS6-2697.

A critical survey of the literature on the use of light-scattering mechanisms in the remote monitoring of atmospheric aerosols, their geographical and spatial distribution, and temporal variations was undertaken to aid in the choice of future operational systems, both ground based and air or space borne. An evaluation, mainly qualitative and subjective, of various techniques and systems is carried out. No single system is found to be adequate for operational purposes. A combination of earth surface and space-borne systems based mainly on passive techniques involving solar radiation with active (lidar) systems to provide auxiliary or backup information is tentatively recommended.

(Author)

A80-38803 # Regional requirements and prospects for the use of remote sensing for the management of territory (Esigenze delle regioni e prospettive dell'uso del telerilevamento per il governo del territorio). P. Mussio (Servizio Informatica, Milan, Italy) and P. Rigamonti. In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 217-229. 24 refs. In Italian.

The use of remotely sensed satellite data for agricultural as well as urban territorial management and resources management is discussed. Attention is given to the proper interpretation and utilization of the data received, and to the use of a systematic survey which can be repeated periodically. Italian regional proposals in this regard are outlined, including the identification of experimental polygons, the constitution of observation centers, the institution of standard instruments and criteria, and the systematic presentation of experimental results.

J.P.B.

A80-39212 * Overview of the NASA tropospheric environmental quality remote sensing program. F. Allario, W. G. Ayers, and J. M. Hoell (NASA, Langley Research Center, Hampton, Va.). In: Atmospheric effects on radiative transfer; Proceedings of the Seminar, San Diego, Calif., August 29, 30, 1979. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 72-86. 36 refs.

This paper will summarize the current NASA Tropospheric Environmental Quality Remote Sensing Program for studying the global and regional troposphere from space, airborne and ground-based platforms. As part of the program to develop remote sensors for utilization from space, NASA has developed a series of passive and active remote sensors which have undergone field test measurements from airborne and ground platforms. Recent measurements with active lidar and passive gas filter correlation and infrared heterodyne techniques will be summarized for measurements of atmospheric aerosols, CO, SO₂, O₃, and NH₃. These measurements provide the data base required to assess the sensitivity of remote sensors for applications to urban and regional field measurement programs. Studies of Earth Observation Satellite Systems are currently being performed by the scientific community to assess the capability of satellite imagery to detect regions of elevated pollution in the troposphere. The status of NASA sponsored research efforts in interpreting satellite imagery for determining aerosol loadings over land and inland bodies of water will be presented, and comments on the potential of these measurements to supplement in situ and airborne remote sensors in detecting regional haze will be made.

(Author)

02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

A80-39217 * Comparison of stack plume properties obtained from aircraft and spacecraft measurements. W. F. Staylor (NASA, Langley Research Center, Marine and Applications Technology Div., Hampton, Va.). In: Atmospheric effects on radiative transfer; Proceedings of the Seminar, San Diego, Calif., August 29, 30, 1979. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 119-124. 5 refs.

Landsat II imagery data and aircraft nephelometer measurements were analyzed to determine the quantitative properties of a stack plume emitted from a moderate-sized pulp mill. Aircraft measurements were obtained at several heights across the plume at 1.0, 3.0, and 6.5 km downwind from the stack, and for comparative purposes, the Landsat data were also analyzed at these same three locations and at 0.5 and 10.0 km. Overlapping, consecutive-day MSS data provided plume/no-plume radiances upwelling from the stack site. Imagery data from a 10- by 10 km region in the vicinity of the mill were normalized to correct for atmospheric, solar, and viewing angle differences for the 2 observation days, and cloud-shadow data were used to evaluate sky radiance. Particle concentrations, vertical and lateral dispersions, and plume heights determined from both the aircraft and spacecraft measurement techniques are in good agreement. (Author)

A80-39705 Environmental change detection in digitally registered aerial photographs. W. Frei, T. Shibata, and G. C. Huth (Southern California, University, Marina del Rey, Calif.). In: Applications of digital image processing III; Proceedings of the Seminar, San Diego, Calif., August 27-29, 1979. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 26-31. 9 refs.

Digital image matching permits analysis of aerial photographs for subtle changes that are not visible to the unaided eye. These changes can be portrayed in pictorial form - a 'change image' - which provides a cost effective early indicator of impending environmental problems. The digital image matching problems encountered in low altitude aerial photographs are studied here, and examples are shown of this method applied to environmental assessment studies. (Author)

A80-39851 # Problems associated with the investigation of the natural environment from manned spacecraft (Problemy issledovaniia prirodnoi sredy s pilotiruemykh kosmicheskikh korabli). B. V. Vinogradov (Akademiia Nauk SSSR, Institut Okeanologii, Leningrad, USSR) and V. I. Sevast'ianov. *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 14-24. 22 refs. In Russian.

Recent Soviet research dealing with the remote sensing of the earth's surface from manned spacecraft is reviewed. Particular attention is given to visual observations, spectrophotometry, and monospectral and multispectral photography performed from the Soyuz and Salyut spacecraft. The use of spacecraft images in agriculture is emphasized; economic factors are discussed. B.J.

A80-40974 Investigation of pollutant concentration distribution over areas of high population density (Untersuchung der Schadstoffkonzentrationsverteilung über Ballungsgebieten). D. Paffrath, W. Peters (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Physik der Atmosphäre, Oberpfaffenhofen, West Germany), and R. Strauss (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Physik der Atmosphäre, Oberpfaffenhofen; Bayerisches Landesamt für Umweltschutz, Munich, West Germany). *DFVLR-Nachrichten*, June 1980, p. 41-46. In German.

The use of aircraft to investigate horizontal and vertical concentration distribution of pollutants in the atmosphere is described. It is shown that in this manner it is possible to determine the horizontal distribution of a surface of about 800 sq km within an hour. The discussion covers possible applications for environmental protection, measurement techniques, and examples of some measurement results. M.E.P.

A80-41295 # Orbital and sensor parameters of remote sensing satellite systems (Parametry orbit i datchikov sistemy IPRZ). N. S. Ramm, A. M. Kuzina, and I. G. Mal'tseva (Vsesoiuznoe Nauchno-Proizvodstvennoe Ob'edinenie Aerogeologii, Laboratoriia Aerometodov, Leningrad, USSR). *Issledovanie Zemli iz Kosmosa*, Mar.-Apr. 1980, p. 57-65. 8 refs. In Russian.

The orbits of remote sensing satellites (Landsat and Meteor) are examined in relation to the period of earth-surface photography, the number of orbital paths, and the time of passage through the ascending node of the orbit. Simple and sufficiently rigorous formulas are derived for the dependence of orbital height and inclination on these parameters. In addition, relationships between the orbital parameters and sensor parameters are examined. The formulas obtained make it possible to simplify ballistic calculations for various systems as well as to evaluate different system designs from the user's point of view. B.J.

A80-41317 * Determination of the properties of a power-plant plume by aircraft and spacecraft measurements. W. F. Staylor (NASA, Langley Research Center, Marine and Applications Technology Div., Hampton, Va.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 329-341.

A80-41672 Utilization of night time aerial thermography in mapping temperature inversion areas. F. Boon (Shebrooke, Université, Sherbrooke, Quebec, Canada) and J. Lévesque. In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 181-197. 7 refs.

Data obtained over Quebec show that thermal infrared remote sensing is a very efficient tool for the mapping of temperature inversion areas. The utilization of nighttime aerial thermography in the 8-14 micron range allows a recognition of areas where the cold air tends to accumulate during inversion conditions. The mapping of inversion sites from thermograms requires the following steps: (1) selecting the appropriate scale of imagery, (2) differentiating the thermal patterns due to microclimate from the patterns related to variations in surface materials or land use, and (3) establishing a probability scale for night frost on crops according to climatic conditions in the geographic test area. B.J.

A80-41834 Land use mapping by means of multitemporal Landsat-MSS data (Landnutzungskartierung mit multitemporalen Landsat-MSS-Daten). J. Lichtenegger (Zürich, Universität, Zurich, Switzerland) and K. Seidel (Zürich, Eidgenössische Technische Hochschule, Zurich, Switzerland). *Bildmessung und Luftbildwesen*, vol. 48, July 1, 1980, p. 123-131. 9 refs. In German.

A detailed mapping of land-use categories for a selected area within the test site 'Grosses Moos', accomplished by using multispectral data (MSS) of the Landsat earth resources and technology satellite, is described. The digital data from several passes over the area were combined into a multitemporal set. It is shown how five data sets were brought into exact registration using digital correlation and combined into a single 20 channel data set. In this manner, all the land use categories could be separated and the percentage in area denoted to each was determined on this data with the help of stepwise, linear discriminant analysis (supervised classification). M.E.P.

N80-22938# World Meteorological Organization, Geneva (Switzerland).

WORLD WEATHER WATCH: GLOBAL OBSERVING SYSTEM-SATELLITE SUB-SYSTEM. INFORMATION ON THE APPLICATION OF METEOROLOGICAL SATELLITE DATA IN ROUTINE OPERATIONS AND RESEARCH:

ABSTRACTS, ANNUAL SUMMARIES AND BIBLIOGRAPHIES

1979 158 p refs

(WMO-475) Avail: NTIS HC A08/MF A01

The titles, abstracts and other relevant information for 59 papers contributed by 14 nations to the World Weather Watch-Global observing system program are presented, in relation to meteorological satellite data applications. Author (ESA)

N80-23722*# Council of State Governments, Lexington, Ky. INTEGRATED USE OF LANDSAT DATA FOR STATE RESOURCE MANAGEMENT

William G. Schneider, Jr., Principal Investigator 1979 41 p refs ERTS

(Contract NASw-3140)

(E80-10095; NASA-CR-162809)

Avail: NTIS

HC A03/MF A01 CSCL 05B

N80-23728*# National Governors Association/Council of State Planning Agencies, Washington, D. C. LANDSAT'S ROLE IN STATE COASTAL MANAGEMENT PROGRAMS

Oct. 1979 18 p Sponsored by NASA ERTS

(E80-10101; NASA-CR-162810)

Avail: NTIS

HC A02/MF A01 CSCL 05B

N80-23729*# National Governors Association/Council of State Planning Agencies, Washington, D. C. LANDSAT'S ROLE IN HUD 701 PROGRAMS

Oct. 1979 15 p Sponsored by NASA ERTS

(E80-10102; NASA-CR-162811)

Avail: NTIS

HC A02/MF A01 CSCL 05B

N80-23756# University of Southern California, Marina del Rey. Medical Imaging Sciences Group.**REMOTE SENSING FOR GEOTHERMAL ENVIRONMENTAL ASSESSMENTS Final Report**

W. Frei, T. Shibata, and G. C. Huth 30 Jun. 1979 35 p refs Sponsored in part by California Univ., Lawrence Livermore Lab. (Contract W-7405-eng-48)

(UCRL-15108) Avail: NTIS HC A03/MF A01

The role of remote sensing is examined in the context of the DOE Environmental Assessment Studies. Particular attention is paid to the exploitation by computer analysis, of low altitude aerial photographs, which were made available for this project. One technique, change detection, developed during this project, was found to be particularly useful because it permits the detection of environmental changes at a very early stage where it might escape detection on the ground. This technique, which was perfected for use on a routine basis, can thus provide a very effective environmental early warning capability. Several examples are shown in known Geothermal Resource Areas (KGRA's) in the Imperial Valley and the Geysers, California, which lead to the conclusion that remote sensing become an essential tool for the Environmental Assessment Studies. DOE

N80-23764# Economics, Statistics and Cooperatives Service, Washington, D. C. Natural Resources Economics Div.**INTERPRETING LAND USE CHANGE THROUGH SATELLITE IMAGERY**

Linda K. Lee Dec. 1979 24 p refs

(PB80-127277; AER-442) Avail: NTIS HC A02/MF A01 CSCL 08B

Employing a multiperiod approach to monitor land use change may compound the problems associated with interpretation of satellite imagery. Data from satellite imagery were used to inventory new cropland development in the Great Plains and 85 counties in the Southeastern Alluvium Coast and Tidewater region between 1972 and 1976. Cloud cover problems, intensified by the two-period approach used, made data more difficult to interpret. Field checks were also more difficult because of the scattered and irregularly shaped land use change sites. GRA

N80-23929# Meteorology Research, Inc., Altadena, Calif. CHARACTERIZATION OF VISIBILITY-REDUCING AEROSOLS IN THE SOUTHWEST. PROJECT VISTA Final Report, 1-10 Oct. 1977

Edward S. Macias, Donald L. Blumenthal, Jerry A. Anderson, and Bruce K. Cantrell Nov. 1979 68 p refs (Contract EPA-68-02-2713)

(PB80-139041; MRI-78-IR-1585; EPA-600/7-79-243) Avail: NTIS HC A04/MF A01 CSCL 04A

The atmospheric visibility-reducing aerosol in the Southwest was experimentally characterized with respect to particle size composition, and contribution to light scattering. Measurements were taken within the mixing layer using the instrumented Beechcraft Queen Air aircraft. The aircraft was equipped to measure and record on magnetic tape the light-scattering coefficient, Aitken nuclei count, size distribution, ozone, sulfur dioxide, nitrogen oxides, temperature, dew point, turbulence, pressure (altitude), and navigational parameters. Multistage impactor and size-fractionated filter samples were also collected in order to determine aerosol elemental composition as a function of size. Visual range estimates were obtained by viewing distant landmarks and verified by optical photography. GRA

N80-25735*# Mississippi State Univ., Mississippi State. APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS Semiannual Progress Report, 1 Nov. 1979 - 30 Apr. 1980

W. Frank Miller, Bradley D. Carter, Nancy Freeman, Jimmy L. Solomon, and Sidney G. Williams, Principal Investigators 1 May 1980 133 p refs ERTS

(Grant NGL-25-001-054)

(E80-10153; NASA-CR-163170; SAPR-13) Avail: NTIS

HC A07/MF A01 CSCL 05B

N80-25736*# Telespazio, S.p.A., Rome (Italy).**AN AUTOMATIC CLASSIFICATION METHOD FOR LANDSAT DATA AS RESULTING FROM DIFFERENT EXPERIENCES IN THE ITALIAN ENVIRONMENT**

Angelo Zandonella, Principal Investigator 1979 15 p refs Presented at the 2nd Congr. Nazl. sul Telerilevamento delle Risorse Terrestri, Varenna, Italy, 1979 Sponsored by NASA ERTS

(E80-10160; NASA-CR-163176)

Avail: NTIS

HC A02/MF A01 CSCL 05B

N80-25737*# Columbia Univ., New York. Dept. of Geography.**APPLICATION OF DIGITAL ANALYSIS OF MSS DATA TO AGRO-ENVIRONMENTAL STUDIES Final Report**

Robert A. Lewis and Samuel N. Goward, Principal Investigators 1 Mar. 1980 14 p ERTS

(Grant NSG-5080)

(E80-10161; NASA-CR-163178)

Avail: NTIS

HC A02/MF A01 CSCL 02C

N80-25740*# Pennsylvania State Univ., University Park. Dept. of Meteorology.**APPLICATION OF HCMM SATELLITE DATA TO THE STUDY OF URBAN HEATING PATTERNS Quarterly Report, 1 Dec. 1979 - 31 May 1980**

Toby N. Carlson, Principal Investigator 1 Dec. 1979 4 p HCMM

(Contract NAS5-24264)

(E80-10165; NASA-CR-163182; QR-8)

Avail: NTIS

HC A02/MF A01 CSCL 13B

N80-25765# Colorado State Univ., Fort Collins. Dept. of Earth Resources.**APPLICATIONS OF REMOTE SENSING TO EMERGENCY MANAGEMENT Final Report, 15 May 1979 - 15 Feb. 1980**

William E. Marlatt and E. Bruce Jones (Resources Consultants, Inc., Fort Collins, Colo.) 15 Feb. 1980 61 p

(Contract DCPA01-79-C-0268)

(AD-A082243) Avail: NTIS HC A04/MF A01 CSCL 14/5

Contents: foundations of remote sensing; data acquisition and interpretation; availability of remote sensing technology for disaster response; imaging systems, current and near future satellite and aircraft remote sensing systems; utilization of remote sensing in disaster response; categories of disasters, phases of

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monitoring activities; recommendations for utilization of remote sensing technology in disaster response: selected reading. GRA

N80-26015# National Environmental Satellite Service, Washington, D. C.

ENVIRONMENTAL SATELLITE IMAGERY

May 1979 100 p refs

(PB80-153356; NOAA-80021221)

Avail: NTIS

HC A05/MF A01 CSCL 04B

Current cloud data obtained by NOAA's operational environmental satellites is described. Daily global satellite imagery in condensed form is presented as a guide to data stored in the NOAA archive, and is designed to assist users in selecting data for research and climatological use. GRA

N80-26736*# Pennsylvania State Univ., University Park. Dept. of Meteorology.

APPLICATIONS OF HCMM SATELLITE DATA TO THE STUDY OF URBAN HEATING PATTERNS Quarterly Report

Toby N. Carlson, Principal Investigator 1 Jun. 1980 4 p HCMM

(Contract NAS5-24264)

(E80-10150; NASA-CR-163167; QR-10)

Avail: NTIS

HC A02/MF A01 CSCL 13B

N80-26892# National Inst. of Public Health, Bilthoven (Netherlands).

AERIAL DETERMINATION OF LONG RANGE TRANSPORT T. Schneider In WMO The Long-Range Transport of Pollutants and its Relation to Gen. Circulation Including Stratospheric/Tropospheric Exchange Processes 1979 p 17-23 refs

Avail: NTIS HC A19/MF A01

Two series of sampling flights over the Netherlands are described: the first measuring the transport of air pollution over sea (from Great Britain), the second studying the interaction of ozone with other pollutants. Levels of SO₂ were found to vary greatly with altitude. Air masses transported over land were found to contain less ozone than those arriving over the sea. The source of the ozone is open to question, but the concentrations correlate with plant damage data. Author (ESA)

N80-26965# AeroVironment, Inc., Pasadena, Calif.

OZONE AND PRECURSOR TRANSPORT INTO AN URBAN AREA: EVALUATION OF MEASUREMENT APPROACHES Final Report

Michael W. Chan, Douglas W. Allard, and Ivar Tombach Dec. 1979 166 p refs

(Contract EPA-68-02-3027)

(PB80-153927; EPA-450/4-79-039)

Avail: NTIS

HC A08/MF A01 CSCL 13B

Five techniques for measuring the transport of ozone and precursors into an urban area are evaluated. The techniques were tested in Philadelphia during the summer of 1978. The data collected in the field program indicate that, in general, advection of ozone aloft is the main route by which pollution of photochemical interest is transported into Philadelphia. Transport of ozone along the surface and transport of oxides of nitrogen and non-methane hydrocarbons, both aloft and along the surface, are minimal. Thus, the recommended techniques must primarily be able to quantify the ozone transported aloft. Of the five techniques, three were determined applicable for quantifying the ozone transported aloft. GRA

N80-27734# World Meteorological Organization, Geneva (Switzerland).

CLIMATE AND CLIMATE MODELING Final Report

B. W. Boville In ESA On Climatol., Hydrol., Atmospheric Res. and Meteorol. (CHARM) from Space Feb. 1980 p 14-18

Avail: NTIS HC A10/MF A01

The problems of monitoring global climate and assessing climatic trends are reviewed. The use of satellite observations in the development of mathematical climatic models is considered. Various international data collection programs are cited. Numerical

weather prediction is emphasized. In relation to man and his impact on the global environment, the problem of fluctuations in the level of atmospheric CO₂ is treated. In conclusion, data requirements regarding climate modeling are specified.

Author (ESA)

N80-27752# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.

OZONE MONITORING FROM SPACE

A. Ghazi In ESA On Climatol., Hydrol., Atmospheric Res. and Meteorol. (CHARM) from Space Feb. 1980 p 143-151 refs

Avail: NTIS HC A10/MF A01

Different methods of ozone observation by satellite are reviewed. A summary of the analyzed satellite ozone data is given. The importance of atmospheric ozone in influencing climate is emphasized based on the theoretical and observational knowledge obtained to date. Future needs of measurements and research priorities are briefly outlined. Author (ESA)

N80-27757# Centre National d'Etudes Spatiales, Paris (France). Paris Univ. (France).

A VIEW ON OUTSTANDING EXPERIMENTAL PROBLEMS IN SPACE OBSERVATION FOR METEOROLOGY AND CLIMATOLOGY

P. Morel In ESA On Climatol., Hydrol., Atmospheric Res. and Meteorol. (CHARM) from Space Feb. 1980 p 185-188 Prepared jointly with Paris Univ.

Avail: NTIS HC A10/MF A01

The application of meteorological satellite observation resources to climatology and related problems is discussed. Data needs include measurements on the radiation balance, the radiation effects of extended cloudiness, heat and moisture transport determinations, sea surface measurements, and ice processes observations. Emphasis is on possible European contributions to gathering this data. Author (ESA)

GEODESY AND CARTOGRAPHY

Includes mapping and topography.

A80-32689 The geopotential from gravity measurements, levelling data and satellite results. W. Bosch and K. R. Koch (Bonn, Universität, Bonn, West Germany). *Bulletin Géodésique*, vol. 54, no. 1, 1980, p. 73-79. 11 refs.

The geodetic boundary value problem is formulated which uses as boundary values the differences between the geopotential of points at the surface of the continents and the potential of the geoid. These differences are computed by gravity measurements and levelling data. In addition, the shape of the geoid over the oceans is assumed to be known from satellite altimetry and the shape of the continents from satellite results together with three-dimensional triangulation. The boundary value problem thus formulated is equivalent to Dirichlet's exterior problem except for the unknown potential of the geoid. This constant is determined by an integral equation for the normal derivative of the gravitational potential which results from the first derivative of Green's fundamental formula. The general solution, which exists, of the integral equation gives besides the potential of the geoid the solution of the geodetic boundary value problem. In addition approximate solutions for a spherical surface of the earth are derived. (Author)

A80-34846 Mapping from aerial photographs. C. D. Burnside (North East London Polytechnic, London, England). London, Granada Publishing, Ltd., 1979. 316 p. 108 refs. \$39.50.

The theoretical principles of producing topographic maps from aerial photographs are described, with emphasis on the mathematical concepts of map construction and the theoretical elements of photogrammetry. Topics covered include the geometry of the aerial photograph, graphical and photographic methods of map production, heights from parallax measurements, stereoscopic models, analog plotting instruments, analog aerial triangulation, analytical photogrammetry, the formation and adjustment of blocks, and ground control. B.J.

A80-34857 Maps and air photographs /2nd edition/. G. C. Dickinson (Leeds University, Leeds, England). New York, Halsted Press, 1979. 359 p. 126 refs. \$39.95.

The principles, history, and utilization of maps and aerial photography are introduced. The gradual extension and development of world mapping is traced against a background of increasing demand and the overcoming of technical obstacles, with aerial photography treated as a recent contributory factor to the ease and extension of mapping. The content and form of maps are examined, and examples of international and national map series are presented. Some of the basic problems that maps and aerial photographs can be used to resolve and techniques for resolving them are described, with attention given to map scales, position determination, area measurement, the enlargement, reduction, amending and copying of maps, accounting for the third dimension, maps as historical records, and the physical and human geographic information obtainable from maps and aerial photographs. A.L.W.

A80-37725 * Gravity anomalies near the east Pacific rise with wavelengths shorter than 3300 km recovered from GEOS-3 satellite-to-satellite Doppler tracking data. J. G. Marsh (NASA, Goddard Space Flight Center, Earth Survey Applications Div., Greenbelt, Md.), B. D. Marsh (Johns Hopkins University, Baltimore, Md.), T. D. Conrad, W. T. Wells, and R. G. Williamson (EG & G Washington Analytical Services Center, Inc., Riverdale, Md.). In: The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International Symposium, Athens,

Greece, May 29-June 2, 1978.

Athens, National Technical University of Athens, 1979, p. 296-342. 22 refs.

A80-37727 Global combination of altimeter data with gradients and other potential and gravity information. E. Groten and H. Schaab. In: The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International Symposium, Athens, Greece, May 29-June 2, 1978.

Athens, National Technical University of Athens, 1979, p. 369-380. 5 refs.

In the present paper, statistical considerations are used in combination with boundary value problem methods to solve the problem of satellite altimetry. The disturbing potential of the earth is determined by combined application of terrestrial (or other) gravity anomalies and satellite altimetry data. V.P.

A80-37728 * Gravity anomaly and geoid undulation results in local areas from GEOS-3 altimeter data. R. H. Rapp (Ohio State University, Columbus, Ohio). In: The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International Symposium, Athens, Greece, May 29-June 2, 1978.

Athens, National Technical University of Athens, 1979, p. 381-392. 7 refs. Research supported by the Ohio State University Research Foundation; Contract No. NAS6-2484.

The adjusted GEOS-3 altimeter data, taken as averages within a data frame, have been used to construct free air anomaly and geoid undulation profiles and maps in areas of geophysical interest. Profiles were constructed across the Philippine Trench (at a latitude of 6 deg) and across the Bonin Trench (at a latitude of 28 deg). In the latter case an anomaly variation of 443 mgals in 143 km was derived from the altimeter data. These variations agreed reasonably with terrestrial estimates, considering the predicted point accuracy was about + or - 27 mgals. An area over the Patton Sea mounts was also investigated with the altimeter anomaly field agreeing well with the terrestrial data except for the point directly over the top of the sea mount. It is concluded that the GEOS-3 altimeter data is valuable not only for determining 5 deg and 1 deg x 1 deg mean anomalies, but also can be used to describe more local anomaly variations. (Author)

A80-37729 The ocean geoid deduced from GEOS-3 satellite radar altimetry data. R. J. Anderle (U.S. Navy, Naval Surface Weapons Center, Dahlgren, Va.). In: The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International Symposium, Athens, Greece, May 29-June 2, 1978.

Athens, National Technical University of Athens, 1979, p. 393-413. 15 refs.

The radar altimeter on board the GEOS-3 satellite, launched 9 April 1975, has provided sufficient data to map the ocean geoid at a 100 km or smaller grid size to approximately one meter accuracy between latitudes of + or - 65 degrees. The geoidal undulation computed from altimeter data are highly reproducible on repeated tracks across the same region and show excellent correlation with bathymetric features. The altimetric heights have a precision of 60 cm at a 0.1 second sample interval (0.7 km in horizontal spacing). Since the satellite position is computed to only 1.5 m accuracy vertically from ground tracking data, orbit biases are estimated and corrected by analysis of the differences in geoid heights computed at the intersections of satellite tracks. An alternative method to reduce the geoid uncertainty due to orbit error is the correction of orbit parameters to find a best fit of the altimetric geoid to a low order reference geoid. (Author)

A80-37730 * Estimation of mean sea surfaces in the North Atlantic, the Pacific and the Indian Ocean using GEOS-3 altimeter data. J. G. Marsh (NASA, Goddard Space Flight Center, Geodynamics Branch, Greenbelt, Md.), T. V. Martin, J. J. McCarthy, and P. J. Chovitz (EG & G Washington Analytical Services Center, Inc., Riverdale, Md.). In: The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International

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Symposium, Athens, Greece, May 29-June 2, 1978.

Athens, National Technical University of Athens, 1979, p. 414-447. 10 refs.

The sea surface heights above the reference ellipsoid were determined for several regions of the world's ocean using data from the radar altimeter on board the GEOS-3 satellite in conjunction with precise orbital position information derived from laser data. The resolution of the estimated sea surfaces varied from 0.25 degrees off the east coast of the United States to about 2 degrees in the Indian Ocean near Australia. The rms crossover discrepancy after adjustment varied from 30 cm to 70 cm depending on geographic location. Comparison of the altimeter derived mean sea surface in the North Atlantic with the 5 x 5 ft GEM-8 detailed gravimetric geoid indicated a relative consistency of better than one meter. V.L.

A80-37731 * **Dynamic sea surface topography from GEOS-3 altimetry - Determination of some dominant parameters.** R. S. Mather, F. J. Lerch (NASA, Goddard Space Flight Center, Geodynamics Branch, Greenbelt, Md.), C. Rizos, E. G. Masters, and B. Hirsch. In: *The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International Symposium, Athens, Greece, May 29-June 2, 1978.* Athens, National Technical University of Athens, 1979, p. 448-477. Research supported by the Australian Research Grants Committee; Grant No. NsG-5225.

The second, third and fourth degree zonal harmonics of the quasi-stationary dynamic sea surface topography can be recovered from the GEOS-3 altimetry despite the adverse levels of noise indicated by the crossover discrepancies generated from the best orbits available at the end of 1977 and the GEOS-3 altimetry. Techniques for modelling the global sea surface topography are discussed along with methods for signal recovery in the presence of significant levels of noise. The analysis also provides a means of defining the geocentricity of the system of reference used in preparing the GEOS-3 ephemeris. (Author)

A80-37732 **Studies of the GEOS 3 altimeter derived geoid undulations over seamounts in the Indian Ocean.** A. Cazenave, K. Dominh (Centre National d'Etudes Spatiales, Groupe de Recherches de Géodésie Spatiale, Toulouse, France), and K. Lambeck (Australian National University, Canberra, Australia). In: *The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International Symposium, Athens, Greece, May 29-June 2, 1978.* Athens, National Technical University of Athens, 1979, p. 478-499. 30 refs.

Methods of estimating the flexural rigidity, which is a measure of the resistance of the lithosphere to deformation, and which can be deduced from loading studies of the lithosphere by ice layers, sediment deposits, and marine volcanos (seamounts) are reviewed. It is shown that GEOS 3 radar altimeter observations are particularly useful in that they permit rapid sampling of geoid undulations over the oceans with good spatial resolution and a precision within 50 to 100 cm. The theory of radar altimeter observations is examined, along with the application of such observations to some features in the southern Indian Ocean. V.P.

A80-39100 **On the compensation mechanism of the Walvis Ridge.** C. L. Angevine and D. L. Turcotte (Cornell University, Ithaca, N.Y.). *Geophysical Research Letters*, vol. 7, June 1980, p. 477-479. Contract No. N00014-79-C-0569.

The broad topographic features associated with the Walvis Ridge in the south Atlantic Ocean have been found to correlate well with the geoid anomalies obtained from the direct determination of sea surface height by the GEOS 3 satellite. It is shown that the topography of the Walvis Ridge is compensated by a Pratt-type mechanism with a depth of compensation between 20 and 30 km. The results obtained from this study, together with the results of other researchers, indicate that a variety of seafloor features may be caused by density anomalies in the upper mantle. V.L.

A80-39858 # **Mapping from space in the USSR (Kosmicheskaya kartografiya v SSSR).** I. A. Kutuzov (Glavnoe Upravlenie Geodezii i Kartografii, Moscow, USSR) and Iu. P. Kienko (Gosudarstvennyi Nauchno-Issledovatel'skii i Proizvodstvennyi Tsentr Priroda, Moscow, USSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 79-87. In Russian.

The advantages of remotely sensed space data for making and revising topographic and thematic maps are reviewed. Special methods for the complex mapping of natural resources are described. B.J.

A80-40618 **All-Union Anniversary Conference on Scientific Problems of Geodesy, Moscow, USSR, May 24-26, 1979, Proceedings (Iubileinaia Vsesoiuznaia Konferentsiia po Nauchnym Problemam Geodezii, Moscow, USSR, May 24-26, 1979, Materialy). Geodeziia i Aerofotos'emka, no. 1, 1980. 133 p. In Russian.**

The papers deal with some relatively recent results in the fields of geodesy, aerial photography, and cartography. The topics covered include a review of the current status and trends of geodesy in the light of modern requirements, a discussion of military contributions of scientific and applied geodesy, and an analysis of some scientific aspects of geodesy. V.P.

A80-40619 # **Space geodesy and aspects of geodesy theory (Kosmicheskaya geodeziia i voprosy teorii v geodezii).** M. M. Mashimov (Voenno-Inzhenernaia Akademiia, Moscow, USSR). *(Iubileinaia Vsesoiuznaia Konferentsiia po Nauchnym Problemam Geodezii, Moscow, USSR, May 24-26, 1979.) Geodeziia i Aerofotos'emka, no. 1, 1980, p. 54-64. 8 refs. In Russian.*

Recent advances in space geodesy are reviewed. Consideration is given to the determination of harmonic coefficients and gravity anomalies from satellite observations; the development of Doppler tracking techniques is emphasized. The three-dimensional model of the earth's metric and the determination of the earth's figure from space-geodetic observations are also examined. B.J.

A80-40620 # **Scientific problems of space geodesy (Nauchnye problemy kosmicheskoi geodezii).** V. P. Vasil'ev and M. S. Urmaev (Moskovskii Institut Inzhenerov Geodezii, Aerofotos'emki i Kartografii, Moscow, USSR). *(Iubileinaia Vsesoiuznaia Konferentsiia po Nauchnym Problemam Geodezii, Moscow, USSR, May 24-26, 1979.) Geodeziia i Aerofotos'emka, no. 1, 1980, p. 70-75. In Russian.*

Some of the principal aspects of space geodesy, such as the determination of the fundamental geodetic constants, improvement of models of the external gravitational field and the figure of the earth, and the construction of global three-dimensional geodetic networks are reviewed. Methods of determining the parameters characterizing satellite motion, constructing models of the forces which keep a satellite in orbit, and determining the coordinates of points of observation are examined. Laser and radio-interferometer applications in space geodesy are discussed. V.P.

N80-26743*# **Applied Science Associates, Inc., Apex, N. C. A STUDY OF GEOS-3 TERRAIN DATA WITH EMPHASIS ON RADAR CROSS SECTION Final Report**
R. W. Priester May 1980 53 p refs
(Contract NAS6-2810)
(NASA-CR-156865) Avail: NTIS HC A04/MF A01 CSCL 08B

Radar cross sections (RCS) of terrain are studied using GEOS 3 radar altimeter data. Maps of RCS for portions of four east coast states (U.S.A.) are presented and used to draw curves of RCS versus inland distance as measured from the land/sea interface. The results show RCS to decay approximately exponentially with inland distance. The GEOS 3 data are also used to develop curves of RCS seasonal variation for the same regions. Observed variations correlate strongly with local potential evaporation. Results also show that farming operations in the state of North Carolina are observable in the RCS data. A restricted method for determining surface roughness features from saturated

average return waveforms for some types of terrain is developed. Sensor bias induced by receiver saturation for certain terrain returns is briefly discussed. J.M.S.

N80-27732*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

GEOID ANOMALIES IN THE VICINITY OF SUBDUCTION ZONES

David C. McAdoo May 1980 46 p refs Submitted for publication
(NASA-TM-80678) Avail: NTIS HC A03/MF A01 CSCI
08E

The regional geoid of the southwest Pacific is matched reasonably well by results from a model of the upper mantle density structure (including slabs) associated with subduction zones of the region. Estimates of the geoid are obtained from Geos-3 and Seasat radar altimeter data. These data are very well suited to the task of detecting intermediate wavelength (600-4000 km) geopotential variations. Actually, subducting slabs can be expected to produce primarily intermediate and longer wavelength variations. Gravimetric profiles across trench/island arc complexes resolve primarily short wavelengths. The model represents subducting slabs as thin surfaces of anomalous mass per unit area. These surfaces are positioned using published seismicity results which detail the configuration of the Benioff zones. Crustal effects are ignored. Effects due to the contrast between the young thermal lithosphere of the behind-arc regions (marginal basins) and the older lithosphere seaward of the trench are modelled. Results indicate that the New Hebrides slab possesses an average areal density anomaly of about 300,000 gm/sq cm. This is about three times that which is estimated for the Tonga-Kermadec slab. Additional modelling suggests that slabs worldwide may be an important source of large, long wavelength gravity highs; i.e., they may contribute substantially to geopotential power of harmonic degree as low as three or four up to twenty or more. Author

N80-27782*# National Aeronautics and Space Administration, Wallops Flight Center, Wallops Island, Va.

AIRBORNE LASER TOPOGRAPHIC MAPPING RESULTS FROM INITIAL JOINT NASA/US ARMY CORPS OF ENGINEERS EXPERIMENT

W. B. Krabill, J. G. Collins (Army Corps of Engineers, Vicksburg, Miss.), R. N. Swift (EG and G Washington Analytical Services Center, Inc., Pocomoke City, Md.), and M. L. Butler (EG and G Washington Analytical Services Center, Inc., Pocomoke City, Md.)
Jun. 1980 36 p
(NASA-TM-73287) Avail: NTIS HC A03/MF A01 CSCI
08B

Initial results from a series of joint NASA/US Army Corps of Engineers experiments are presented. The NASA Airborne Oceanographic Lidar (AOL) was exercised over various terrain conditions, collecting both profile and scan data from which river basin cross sections are extracted. Comparisons of the laser data with both photogrammetry and ground surveys are made, with 12 to 27 cm agreement observed over open ground. Foliage penetration tests, utilizing the unique time-waveform sampling capability of the AOL, indicate 50 cm agreement with photogrammetry (known to have difficulty in foliage covered terrain). Author

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GEOLOGY AND MINERAL RESOURCES

Includes mineral deposits, petroleum deposits, spectral properties of rocks, geological exploration, and lithology.

A80-35306 * Optimum thermal infrared bands for mapping general rock type and temperature from space. Q. A. Holmes, D. R. Nüesch (Michigan, Environmental Research Institute, Ann Arbor, Mich.), and R. K. Vincent (Geospectra Corp., Ann Arbor, Mich.). *Remote Sensing of Environment*, vol. 9, May 1980, p. 247-263. 18 refs. Contract No. NAS9-15362. NASA Task 2.

A study was carried out to determine quantitatively the number and location of spectral bands required to perform general rock type discrimination from spaceborne imaging sensors using only thermal infrared measurements. Beginning with laboratory spectra collected under idealized conditions from relatively well-characterized homogeneous samples, a radiative transfer model was used to transform ground exitance values into the corresponding spectral radiance at the top of the atmosphere. Taking sensor noise into account, analysis of these data revealed that three 1 micron wide spectral bands would permit independent estimations of rock type and sample temperature from a satellite infrared multispectral scanner. This study, which ignores the mixing of terrain elements within the instantaneous field of view of a satellite scanner, indicates that the location of three spectral bands at 8.1-9.1, 9.5-10.5, and 11.0-12.0 microns, and the employment of appropriate preprocessing to minimize atmospheric effects makes it possible to predict general rock type and temperature for a variety of atmospheric states and temperatures. (Author)

A80-37736 Space techniques as a part of crustal dynamic monitoring networks in earthquake zones. A. Vogel (Berlin, Freie Universität, Berlin, West Germany). In: *The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International Symposium, Athens, Greece, May 29-June 2, 1978.* Athens, National Technical University of Athens, 1979, p. 564-570. 25 refs.

The use of space systems in the monitoring of crustal dynamics in earthquake zones for the investigation of earthquake dynamics and prediction is discussed. Presently used techniques for crustal dynamics monitoring are considered, including the analysis of seismograms, observations of rock fractures and strain accumulation from acoustic emissions at microearthquake stations, measurements of variations in crustal elasticity and magnetic and electrical properties, strainmeters, high-precision terrestrial geodetic measurements, stress measurements and relative or absolute gravity measurements. It is argued that space techniques such as artificial satellite and lunar laser ranging and long-baseline interferometry from extragalactic sources should be combined with terrestrial methods in order to obtain a better understanding of slow-motion dynamics in selected areas of seismotectonic activity, and an example of such a system is presented. A.L.W.

A80-38801 # Contribution of remote sensing to the geological problems of the country (Contributo del telerilevamento ai problemi geologici del paese). R. Cassinis (Società Italiana per il Telerilevamento, Milan, Italy). In: *Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings.* Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 191-198. 19 refs. In Italian.

The relationship between data observed by remote sensing and by other methods is considered with regard to geological exploration.

Geological objectives of remote sensing include the study of geodynamic problems, structures favoring the accumulation of hydrocarbons, and the search for minerals and subterranean water. The application of remote sensing to geological problems in Italy has resulted in the relocation of historical epicenters of earthquakes and the definition of active seismic lines; and remote sensing is also used to search for geothermal energy and active volcanoes. Attention is given to the study of seismicity in Italy and the exploration for surface thermal inertia within the HCMM experiment. J.P.B.

A80-38815 # Electronic photointerpretation, using digital processing, for applications in structural geology (Fotointerpretazione elettronica, mediante l'impiego di elaboratori digitali, per applicazioni nel settore geologico strutturale). C. M. Marino and L. Vescovo (Milano, Università, Milan, Italy). In: *Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings.* Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 355-362. 6 refs. In Italian.

In order to evaluate the contribution of spacecraft data in the field of structural geology, research was conducted in the Apennines. The work utilized Landsat CCT for the enhancement of the structural image information content and the automatic tracing of the features. The method considered is based on the concept of reflectivity anomaly and detects ranges of linearity. Attention is given to the type of support (analog or digital), the passages and bands to be analyzed, and to the contribution in the interpretative phase of optoelectronic processing. Also considered is the possibility of using automatic or semiautomatic processing for the tracing of elements. J.P.B.

A80-39855 # Space data and geological research (Kosmicheskaia informatsiia i geologicheskie issledovaniia). V. N. Briukhanov (Vsesoiuznoe Aerogeologicheskoe Nauchno-Proizvodstvennoe Ob'edinenie Aerogeologiya, Moscow, USSR) and V. M. Moralev (Akademiia Nauk SSSR, Institut Litofery, Moscow, USSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 49-54. 18 refs.

The application of remotely sensed space imagery to the interpretation of geological features is considered; a review of the literature is given. It is shown that the most important structural features which can be revealed in space images are different types of lineaments and lineament patterns as well as ring structures. The distribution of mineral deposits is shown to be correlated with lineaments and ring structures. B.J.

A80-41292 # Current aspects of the development of remote sensing techniques for geological studies (Sovremennye aspekty razvitiia distantsionnykh metodov geologicheskikh issledovaniy). V. B. Komarov (Vsesoiuznoe Aerogeologicheskoe Nauchno-Proizvodstvennoe Ob'edinenie Aerogeologiya, Laboratoriia Aero-metodov, Leningrad, USSR). *Issledovanie Zemli iz Kosmosa*, Mar.-Apr. 1980, p. 28-33. In Russian.

Remote sensing methods of geological exploration are reviewed, with attention given to sidelooking radar, infrared, and multispectral techniques. The need for developing computer processing of various remote sensing data is emphasized, and it is noted that the most successful application of remote sensing to geology may be achieved by examining the relationship between geological and landscape features in different parts of the electromagnetic spectrum. B.J.

A80-41293 # The use of space photogeological maps for the prediction of ore deposits (Ispolzovanie kosmofotogeologicheskikh kart pri prognoze rudnykh raionov). M. A. Beloborodov and V. S. Kogen (Vsesoiuznoe Aerogeologicheskoe Nauchno-Proizvodstvennoe Ob'edinenie Aerogeologiya, Moscow, USSR). *Issledovanie Zemli iz Kosmosa*, Mar.-Apr. 1980, p. 34-43. In Russian.

The basic principles of space photogeological mapping are reviewed, and methods for using geological, geophysical, and space photogeophysical data for the prediction of ore deposits are

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described. Some examples of the photogeological mapping of the Soviet Union are examined. (Author)

A80-41674 An inventory of peatlands in northeastern Ohio using Landsat imagery. R. Craig, M. Dougherty, and M. Schmidt (Kent State University, Kent, Ohio). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 215-225. 10 refs.

Of the major sources of energy available in the United States, peat ranks second only to coal in total Btu's. However, in the exploitation of peat as an energy resource, the United States has lagged far behind other countries. The present paper proposes that Landsat imagery be used to create a countrywide inventory of peat deposits and attempts to demonstrate (using northeastern Ohio as an example) the feasibility of such a project. Certain basic standards for the precision of such an inventory are recommended. B.J.

A80-43361 * Middle infrared multispectral aircraft scanner data - Analysis for geological applications. A. B. Kahle, D. P. Madura, and J. M. Soha (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Applied Optics*, vol. 19, July 15, 1980, p. 2279-2290. 19 refs. Contract No. NAS7-100.

Multispectral middle IR (8-13 microns) data were acquired with an aircraft scanner over Utah. Because these digital image data were dominated by temperature, all six channels were highly correlated. Extensive processing was required to allow geologic photointerpretation based on subtle variations in spectral emittance between rock types. After preliminary processing, ratio images were produced and color ratio composites created from these. Sensor calibration and an atmospheric model allowed determination of surface brightness, temperature, emittance, and color composite emittance images. The best separation of major rock types was achieved with a principal component transformation, followed by a Gaussian stretch, followed by an inverse transformation to the original axes. (Author)

N80-23735*# Consiglio Nazionale delle Ricerche, Milan (Italy). Istituto per la Geofisica della Litosfera.

STUDY OF GEOLOGICAL STRUCTURE OF SICILY AND OTHER ITALIAN AREAS Progress Report

Robert Cassinis, Giovanni Maria Lechi, Principal Investigators, Pietro Alessandro Brivio, Renzo Moretti, and Eugenio Zilioli Jan. 1980 9 p Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601). Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(E80-10108; NASA-CR-162819; RN-304; PR-2) Avail: NTIS HC A02/MF A01 CSCL 08B

N80-23736*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

INTEGRATED SURVEYS OF THE NATURAL RESOURCES IN THE AMAZONIA NATIONAL PARK (TOPAJOS) BASED ON LANDSAT IMAGES [LEVANTAMENTO INTEGRADO DOS RECURSOS NATURAIS DA AREA DO PARQUE NACIONAL DA AMAZONIA (TAPAJOS), BASEADO NAS IMAGENS MSS DO LANDSAT]

Nelson deJesusParada, Principal Investigator, Joaquim Henrique Duran Pinto, Joao Roberto dosSantos, Liu Chan Chiang, Madalena Niero, Sergio dosAnjos Ferreira Pinto, and Vitor Celso deCarvalho Sep. 1979 59 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color illustrations ERTS (E80-10109; NASA-CR-162820; INPE-1577-RPE/074) Avail: NTIS HC A04/MF A01 CSCL 08F

N80-24737# LKB Resources, Inc., Huntingdon Valley, Pa. NURE AERIAL GAMMA-RAY AND MAGNETIC RECONNAISSANCE SURVEY, COLORADO-ARIZONA AREA: SALTON SEA NI 2-9, PHOENIX NI 12-7, EL CENTRO

NI 2-12, AJO NI 12-10, LUKEVILLE NH 12-1 QUADRANGLES. VOLUME 1: NARRATIVE REPORT

Nov. 1979 258 p refs
(Contract EY-76-C-12-1664)
(GJBX-12(80)-Vol-1) Avail: NTIS HC A12/MF A01

A rotary-wing reconnaissance high sensitivity radiometric and magnetic survey, encompassing several 1:250,000 quadrangles in southwestern Arizona and southeastern California, was performed. The surveyed area consisted of approximately 9300 line miles. The radiometric data were corrected and normalized to 400 feet terrain clearance. The data were identified as to rock type by correlating the data samples with existing geologic maps. Statistics defining the mean and standard deviation of each rock type are presented as listings in volume 1 of this report. The departure of the data from its corresponding mean rock type is computed in terms of standard deviation units and is presented as computer listings in microfiche form. The local geology is described, and the magnetic and radiometric data is discussed and selected uranium anomalies are evaluated. DOE

N80-25733*# Geological Survey, Denver, Colo.

GEOLOGIC APPLICATION OF THERMAL-INERTIA MAPPING FROM SATELLITE Progress Report, Dec. 1979 - Feb. 1980

Terry W. Offield, Principal Investigator, Susanne H. Miller, and Kenneth Watson Feb. 1980 3 p Sponsored by NASA HCMM

(E80-10151; NASA-CR-163168) Avail: NTIS HC A02/MF A01 CSCL 08B

N80-25738*# Stanford Univ., Calif. Dept. of Geology.

HCMM: SOIL MOISTURE IN RELATION TO GEOLOGIC STRUCTURE AND LITHOLOGY, NORTHERN CALIFORNIA Ernest I. Rich, Principal Investigator 21 Apr. 1980 2 p HCMM

(Contract NAS5-24479)
(E80-10163; NASA-CR-163180) Avail: NTIS HC A02/MF A01 CSCL 08M

The author has identified the following significant results. Empirical observations on the ground and examination of aerial color IR photographs indicate that in grassland terrain, the vegetation overlying sandstone tends to become less vigorous sooner in the late spring season than does the area overlain by an adjacent shale unit. The reverse relationship obtains in the fall. These relationships are thought to be a reflection of the relative porosity of each of the units and hence of their ability to retain or lose soil moisture. A comparison of the optically enlarged day and night IR imagery of the Late Mesozoic interbedded sandstone and shale units along the western margin of the Sacramento Valley, California, taken at seasonally critical times of the year (late spring/early summer and late fall/early winter) reveals subtle seasonal variations of graytone which tend to support the empirical observations after consideration of Sun angle and azimuth, and the internal consistency of the data on each set of satellite imagery.

N80-25770*# New Mexico Univ., Albuquerque. Technology Applications Center.

REMOTE SENSING APPLIED TO PETROLEUM AND MINERAL EXPLORATION. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Dec. 1979

Robert W. Gonzales Feb. 1980 34 p Sponsored by NASA and NTIS

(NASA-CR-163311; PB80-804800) Avail: NTIS HC \$30.00/MF \$30.00 CSCL 08I

The use of LANDSAT Satellites and other remote sensing methods used in petroleum and mineral exploration is discussed in 118 abstracts. Topics covered include mineral deposits, oil exploration, petroleum operations, geomorphology, resources management, thematic mapping, photogeology, photomapping and photointerpretation and imaging and digital techniques. GRA

N80-26775# Geological Survey, Reston, Va.
U.S. GEOLOGICAL SURVEY SOURCES OF PHOTOGRAPHS AND IMAGES OF BIOSPHERE RESERVES TAKEN FROM SPACECRAFT AND AIRCRAFT, SEQUOIA, KINGS, CANYON NATIONAL PARK, CALIFORNIA. PROJECT NO. 8: CONSERVATION OF NATURAL AREAS AND OF THE GENETIC MATERIAL THEY CONTAIN

Janet Bonner, comp. 1980 12 p refs
 (PB80-147291) Avail: NTIS HC A02/MF A01 CSCL 08F

Photographs and images of biosphere reserves taken from spacecraft and aircraft provide a significant data base showing broad views and details of the landscape and are invaluable in searching for changes and trends in forest, cover, water area, and other diagnostic landscape features. Each data report in this series lists remotely sensed data gathered from spacecraft and aircraft available for a single biosphere reserve. Computer listings of data are provided by the EROS Data Center of the U.S. Geological Survey, which contains in its archives all of the listed material in photographic form and, in the case of LANDSAT images, can make available computer-compatible magnetic tapes of any LANDSAT scene. GRA

N80-26728*# London Univ. (England). Dept. of Geography.
HCMM AND LANDSAT IMAGERY FOR GEOLOGICAL MAPPING IN NORTHWEST QUEENSLAND

M. M. Cole and D. J. Edmiston, Principal Investigator [1980]
 7 p refs Sponsored by NASA HCMM
 (E80-10141; NASA-CR-163159) Avail: NTIS
 HC A02/MF A01 CSCL 08B

The author has identified the following significant results. Photographic prints made from negatives of day-visible and day-IR cover of selected areas were compared with enhanced color composites generated from LANDSAT computer compatible tapes and films. For geological mapping purposes, HCMM imagery is of limited value. While large scale features like the Mitakoodi anticlinorium, contrasting lithological units, and major structures may be distinguished on day-visible and day-IR cover, the spectral bands are too broad and the resolution too coarse even for regional mapping purposes. The imagery appears to be most useful for drainage studies. Where drainage is seasonal, sequential imagery permits monitoring of broad scale water movement while the day-IR imagery yields valuable information on former channels. In plains areas subject to periodic change of stream courses, comparable IR cover at a larger scale would offer considerable potential for reconstruction of former drainage patterns essential for the correct interpretation of geochemical data relative to mineral exploration.

N80-26729*# London Univ. (England).
HCMM IMAGERY FOR THE DISCRIMINATION OF ROCK TYPES, THE DETECTION OF GEOTHERMAL ENERGY SOURCES AND THE ASSESSMENT OF SOIL MOISTURE CONTENT IN WESTERN QUEENSLAND AND ADJACENT PARTS OF NEW SOUTH WALES AND SOUTH AUSTRALIA
Progress Report

Monica M. Cole, Principal Investigator 28 Feb. 1980 5 p
 Sponsored by NASA HCMM
 (E80-10142; NASA-CR-163160) Avail: NTIS
 HC A02/MF A01 CSCL 08M

The author has identified the following significant results. Day-visible and day-IR imagery of northwest Queensland show that large scale geological features like the Mitakoodi anticlinorium, which involves rocks of contrasting lithological type, can be delineated. North of Cloncurry, the contrasting lithological units of the Knapdale quartzite and bedded argillaceous limestones within the Proterozoic Corella sequence are clearly delineated in the area of the Dugald River Lode. Major structural features in the Mount Isa area are revealed on the day-visible cover which provides similar but less detailed information than the LANDSAT imagery. The day-IR cover provides less additional information for areas of outcropping bedrock than had been expected. Initial studies of the day-IR and night-IR cover for parts of South Australia suggest that they contain additional information on geology compared with day-visible cover.

N80-26730*# Bureau de Recherches Geologiques et Minieres, Orleans (France).

SPATIAL THERMAL RADIOMETRY CONTRIBUTION TO THE MASSIF ARMORICAIN AND THE MASSIF CENTRAL (FRANCE) LITHO-STRUCTURAL STUDY Progress Report, Aug. 1979 - Feb. 1980

Jean-Yves Scanvic, Principal Investigator Mar. 1980 25 p
 refs Sponsored by NASA and CNES HCMM
 (E80-10143; NASA-CR-163161) Avail: NTIS
 HC A02/MF A01 CSCL 08G

The author has identified the following significant results. Although the limited number of images received did not permit construction of a thermal inertia map, important geological details were obtained in the areas of lithology and tectonics. Interpretation of day, night, and seasonal imagery resulted in differentiating broad calcareous and dolomitic units in the Causse Plateau. In the Massif armoricain, some granite massifs were delineated which were not observed by LANDSAT. Neotectonic faults were also revealed.

N80-26734*# Geological Survey, Denver, Colo.
GEOLOGIC APPLICATION OF THERMAL-INERTIA MAPPING FROM SATELLITE Progress Report, Dec. 1979 - Feb. 1980

Terry W. Offield, Principal Investigator, Susanne H. Miller, and Kenneth Watson Feb. 1980 3 p Sponsored by NASA HCMM
 (E80-10147; NASA-CR-163165) Avail: NTIS
 HC A02/MF A01 CSCL 08G

N80-26759# South Carolina Land Resources Conservation Commission, Columbia.

APPLICATION OF SATELLITE DATA TO SURFACE MINE MONITORING IN SELECTED COUNTIES OF SOUTH CAROLINA Final Report, Sep. 1977 - Sep. 1978

James N. Bayne and Hewson Lawrence Mar. 1979 141 p
 refs
 (Grant DI-BM-GO-177166)
 (PB80-144629; BM-OFR-11-80) Avail: NTIS
 HC A07/MF A01 CSCL 08I

The LANDSAT data from computer compatible tapes were used to explore the capability of LANDSAT digital imagery to monitor mining and reclamation activity in several South Carolina mining operations. Differentiation between active-spoil-partially and completely reclaimed areas was successfully demonstrated including small mining operations of less than 30 acres. GRA

N80-27778*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

MAGSAT SCIENTIFIC INVESTIGATIONS

Robert A. Langel May 1980 42 p refs Submitted for publication
 (NASA-TM-80698) Avail: NTIS HC A03/MF A01 CSCL 08G

The Magsat spacecraft is providing the first global, vector magnetic survey. Investigations using the Magsat data are being carried out by scientists at NASA's Goddard Space Flight Center, at the U.S. Geological Survey of the Department of the Interior and by 32 selected investigators. Nineteen of the investigators are from the United States and 13 are from various foreign nations. The investigations described fall into four categories: (1) geomagnetic field modeling; (2) crustal magnetic anomaly studies; (3) investigations of the inner Earth: the core, mantle and core-mantle interface; and (4) studies of external current systems. Author

N80-27785# Bendix Field Engineering Corp., Grand Junction, Colo.

DEVELOPMENT OF DATA ENHANCEMENT AND DISPLAY TECHNIQUES FOR STREAM-SEDIMENT DATA COLLECTED IN THE NATIONAL URANIUM RESOURCE EVALUATION PROGRAM OF THE UNITED STATES DEPARTMENT OF ENERGY

G. S. Koch, Jr. (Georgia Univ., Athens), R. J. Howarth (Imperial Coll., London), R. H. Carpenter (Georgia Univ., Athens), and J.

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H. Schvenemeyer (Delaware Univ.) Athens, Ga. Georgia Univ.
Aug. 1979 236 p refs
(Contract EY-76-C-13-1664)
(GJBX-28(80)) Avail: NTIS HC A11/MF A01

Statistical, mapping, and geological techniques were combined in order to evaluate and appropriately display geochemical data for the identification of uranium associated halos utilizing the NURE hydrogeochemical and stream sediment reconnaissance data base. A set of computer-based procedures implemented in a time-sharing interactive mode on a Control Data Corporation Cyber 70 and 174 computer was developed. Techniques of data analysis are developed. Results of the data analysis for the Southeastern area, Seguin quadrangle, and Pueblo quadrangle are presented. Conclusions are drawn and recommendations are stated.
DOE

OCEANOGRAPHY AND MARINE RESOURCES

Includes sea-surface temperature, ocean bottom surveying imagery, drift rates, sea ice and icebergs, sea state, fish location.

A80-33348 The significance of satellite remote sensing for shipping (Die Bedeutung der Satelliten-Fernerkundung für die Schifffahrt). W. Alpers (Hamburg, Universität; Max-Planck-Institut für Meteorologie, Hamburg, West Germany). (Hermann-Oberth-Gesellschaft, Symposium über Satelliten im Dienst des internationalen Verkehrs, Hamburg, West Germany, June 9, 1979.) *Astronautik*, vol. 16, no. 4, 1979, p. 104-107. In German.

The paper demonstrates that satellite remote sensing makes it possible to obtain information on meteorological and oceanographic conditions of wide areas of the ocean in a short time. Attention is given to the three areas of importance to shipping, seaway, wind on the sea surface, and icebergs, noting that optimum routing of shipping allows more economical and efficient operation. Also discussed are the satellites presently in use as well as those specifically for oceanographic purposes - GEOS 3 and Seasat 1. Finally, future satellite services for shipping are surveyed. M.E.P.

A80-35691 # Use of satellite radiation information for obtaining oceanic surface temperature charts (Ispol'zovanie sputnikovoi radiatsionnoi informatsii dlia postroeniia kart temperaturny poverkhnosti okeana). V. V. Vinogradov (Gosudarstvennyi Okeanograficheskii Institut, Leningrad, USSR). *Okeanologiya*, vol. 20, Mar.-Apr. 1980, p. 335-344. 13 refs. In Russian.

Some aspects are examined of the reception and computer-aided processing of IR radiation data from operational satellites with a view to the utilization of the data for charting oceanic surface temperatures. Surface temperature measurements performed during the same time periods on board ships, satellites, and aircraft in the same area of the Atlantic Ocean are compared. V.P.

A80-36289 On the variability of surface temperature fronts in the western Pacific, as detected by satellite. G. I. Roden (Washington, University, Seattle, Wash.). *Journal of Geophysical Research*, vol. 85, May 20, 1980, p. 2704-2710. 19 refs. Contract No. N00014-75-C-502. NR Project 083-012.

The paper investigates the variability of sea surface temperature fronts in the western North Pacific on the basis of satellite and shipboard data. Attention is given to fronts recognized by the satellite on a 100 km by 100 km grid over a period of 1 week, which include the subarctic front, the subtropical fronts, and one to two fronts associated with Kuroshio intrusion. It is shown that the findings by satellite are in broad agreement with those derived from shipboard observations employing a similar sampling scheme. Further, in order to study the relationship between satellite-derived temperature fronts and atmospheric flow patterns, the subtropical front is related to the configuration of the wind stress field. It is found that the oceanic front occurred near a persistent atmospheric front in a region where the vorticity and deformation of the wind stress change sign. M.E.P.

A80-37575 * Spaceborne imaging radar - Monitoring of ocean waves. R. C. Beal (Johns Hopkins University, Applied Physics Laboratory, Laurel, Md.). *Science*, vol. 208, June 20, 1980, p. 1373-1375. 8 refs. NASA-supported research; Contract No. NOAA-MO-A01-78-00-4330.

A well-organized, very low energy ocean swell system off the East Coast of the United States was tracked with the Seasat synthetic

aperture radar from deep water, across the continental shelf, and into shallow water. The results indicate that spaceborne imaging radar may be used to accurately measure ocean wavelength and direction, even in coastal areas and in the presence of a mixed ocean. (Author)

A80-37597 Satellite sensing of ocean surface dynamics. J. R. Apel (NOAA, Pacific Marine Environmental Laboratory, Seattle, Wash.). In: Annual review of earth and planetary sciences. Volume 8. Palo Alto, Calif., Annual Reviews, Inc., 1980, p. 303-342. 56 refs.

The article is a representative review of selected results on the dynamics of the sea surface as obtained from satellite remote measurements with literature published through mid-1979 examined. Examples of methods for the determination of quantitative values for certain parameters of ocean surface dynamics theory are presented. Dynamics on planetary scale, mesoscale, and small scale are treated. These scales correspond roughly to physical events in the ocean: large-scale circulation and its variability; mesoscale eddy and upwelling motions; and small-scale fronts, internal waves, and surface gravity and capillary waves. Some preliminary results from Seasat are discussed. B.J.

A80-37733 * GEOS-3 altimetry - Temporal variations in models of the Sargasso Sea. R. S. Mather, R. Coleman, and B. Hirsch. In: The use of artificial satellites for geodesy and geodynamics. Volume 2 - Proceedings of the Second International Symposium, Athens, Greece, May 29-June 2, 1978. Athens, National Technical University of Athens, 1979, p. 500-530. 7 refs. Research supported by the Australian Research Grants Committee; Grant No. NSG-5225.

The Sargasso Sea test area lies to the east of the United States. Of the three possible modes, only the method of regional solutions and the method of overlapping passes are capable of using GEOS-3 altimetry data for oceanographic studies at the minimal plus or minus 50 cm resolution required for mapping of ocean eddies. In the present paper, the results obtained by these two methods are summarized, and the problems to be overcome in the recovery of quasi-stationary sea surface topography maintaining the steady-state component of the Gulf Stream are discussed. V.P.

A80-37766 The physical oceanography of two rings observed by the Cyclonic Ring Experiment. I - Physical structures. A. C. Vastano, J. E. Schmitz, and D. E. Hagan (Texas A & M University, College Station, Tex.). *Journal of Physical Oceanography*, vol. 10, Apr. 1980, p. 493-513. 26 refs. NSF Grant No. OCE-76-80217; Contract No. N00014-75-C-0537.

Eight cruises over a 10-month period in the North Atlantic have provided the Cyclonic Ring Experiment with observations of two rings. Life histories, structure and structural changes have been studied with emphasis on the effects of Stream interaction and spindown processes. Ring AL was generated in September 1976 with a central water mass composed of Slope and anticyclonic ring waters. Ring BOB separated from the Stream in March 1977 with a Shelf and Slope Water core. Both rings had a 7-month lifetime, interacted with the Gulf Stream and were regenerated. The Stream interaction altered the core structures, and in the case of BOB, cruise observations show significant changes in ring size and shape. BOB's spatial extent decreased with interaction and increased during spindown while eccentricity of the ring behaved in an opposite manner. (Author)

A80-37768 Scales of thermal variability in the tropical Pacific. T. P. Barnett and W. C. Patzert (California, University, La Jolla, Calif.). *Journal of Physical Oceanography*, vol. 10, Apr. 1980, p. 529-540. 31 refs. NSF Grant No. OCE-76-80183.

The paper discusses the long-range P-3 aircraft which were used to drop airborne expendable bathythermographs (AXBT's) along two long meridional sections across the central equatorial Pacific. The

sections were occupied approximately every week for two to three months, depending on the longitude. Analysis of the space time scales of the temperature section time series suggested conclusions which included: (1) large-scale coherent meridional variability exists in the region within plus or minus 10 deg of the equator; (2) at 150 deg W, the large scale variability generally extends coherently across the equator, the boundaries between major equatorial currents, and the intertropical convergence zone; (3) some dissimilarity exists between the two meridional sections in the latitude range of the Line Islands, suggesting that the island may play a predominant role in 'contaminating' temperature observations in the vicinity; and (4) a large scale east-west coherence between the two sections was observed near the bottom of the mixed layer. A.T.

A80-38601 A method of digital image processing for the enhancement of oceanographic features in Landsat data (Ein Verfahren der digitalen Bildverarbeitung zur Hervorhebung ozeanographischer Phänomene aus Landsat-Daten). O. G. Malan (South African Council for Scientific and Industrial Research, National Physical Research Laboratory, Pretoria, Republic of South Africa). *Bildmessung und Luftbildwesen*, vol. 47, Sept. 1, 1979, p. 161-165. 5 refs. In German.

The paper demonstrates that by calculation of the mean of the radiance values of groups of several lines and samples in Landsat data a decreased spatial resolution can be simulated. It is shown that provided the increased precision of the resulting radiance values is retained, a dramatic enhancement of low contrast features, of particular interest over bodies of water can be achieved. M.E.P.

A80-38789 # Earth-oriented research at ESA - Preparation of a new programme. R. Tessier (ESA, Paris, France). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 49-56.

The earth-oriented research program of the ESA is discussed in terms of missions and boundary conditions. The objectives and areas of scientific interest in climatology/atmospheric physics, oceanography, ice studies and solid earth physics are considered in detail. Satellite instrumentation and preliminary satellite design are also surveyed. J.P.B.

A80-38807 # Determination of chlorophyll concentration in the sea from Nimbus-7 Coastal Zone Color Scanner (CZCS) data. B. Sturm (EURATOM and Comitato Nazionale per l'Energia Nucleare, Centro Comune di Ricerca, Ispra, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 271-283. 14 refs.

Techniques used to extract quantitative information on chlorophyll distribution in the upper layers of the sea from Nimbus-7 Coastal Zone Color Scanner (CZCS) data are presented and applied to images of the coastal Tyrrhenian Sea. The relation between the concentration of chlorophyll-like pigments in the upper layers of the sea and the ratio of spectral upwelling radiance at 443 and 550 nm is presented, and techniques for the evaluation of the water-leaving spectral radiance from the measured radiance, glitter radiance, atmospheric transmittance and scattered path radiance for each pixel of CZCS imagery are outlined. Results of the application of a computer program based on the possible chlorophyll retrieval algorithms to CZCS CCTs of the Ligurian and Tyrrhenian coast of Italy are illustrated, and are shown to correspond to measured chlorophyll-a values. The utility of CZCS imagery in chlorophyll determinations in coastal waters with low suspended inorganic matter is concluded, although the various chlorophyll algorithms presently available tend to disagree at high chlorophyll concentrations. A.L.W.

A80-39025 Satellite evidence of enhanced upwelling along the European continental slope. R. R. Dickson, P. A. Gurbutt (Ministry of Agriculture, Fisheries and Food, Fisheries Laboratory, Lowestoft, Suff., England), and V. N. Pillai. *Journal of Physical Oceanography*, vol. 10, May 1980, p. 813-819. 5 refs.

TIROS-N AVHRR imagery is used to describe a persistent but localized band of upwelling which follows the contours of the European continental slope from the Porcupine Seabight (southwest of Ireland) to the Bay of Biscay. Its persistent occurrence, its close association with the upper part of the slope, and the northward broadening of the upwelling region are shown to be consistent with recently published theory (Killworth, 1978) concerning the enhancement of upwelling by interaction between slope topography and Kelvin (or other) waves propagating along the slope. Some limited evidence of enhanced biological productivity is also described. (Author)

A80-39158 Quantitative remote sensing using aerial photography, assisted by the LETIC image processing system (Télédétection quantitative par photographie aérienne à l'aide du système LETIC de traitement d'image). A. Llebaria (CNRS, Laboratoire d'Astronomie Spatiale, Marseille, France) and C. Valerio (CETE, Aix-en-Provence, France). In: Pattern recognition and artificial intelligence; Congress, 2nd, Toulouse, France, September 12-14, 1979, Proceedings. Volume 2. Rocquencourt, Yvelines, France, Institut de Recherche d'Informatique et d'Automatique, 1979, p. 84-90. 10 refs. In French.

An operational system of quantitative remote sensing, designed for the study of coastal marine pollution, is presented. The sensing method uses aerial photography and rhodamine B as a tracer in the water. Parasitic effects are suppressed by a selective extraction method based on the use of the LETIC interactive image processing system. B.J.

A80-39222 Measurements of atmospheric transmittance in a maritime environment. W. H. Wilson (California, University, La Jolla, Calif.). In: Atmospheric effects on radiative transfer; Proceedings of the Seminar, San Diego, Calif., August 29, 30, 1979. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 153-159. 12 refs. Grant No. NOAA-04-6-158-44033; Contract No. N00014-78-C-0566.

For quantitative analysis of ocean color from high altitude or orbital platforms, it is necessary to correct the apparent signal for losses and gains due to atmospheric scattering and absorption. However, comprehensive knowledge of the transmittance and path radiance of the atmosphere over the oceans necessary for these corrections is limited. In order to support studies of ocean color utilizing the Coastal Zone Color Scanner aboard Nimbus-7, measurements of atmospheric transmittance and path radiance have been made at a number of maritime stations. The measurements were made at ten wavelengths between 400 and 750 nanometers and have provided new insight into atmospheric scattering and absorption over the ocean. A description of the solar transmissometer used in the program is provided along with some of the measurements. Comparisons of the measurements with predictions from the atmospheric transmittance program LOWTRAN have been made and are discussed. The significance of the measurements to the remote sensing of the ocean color is also reviewed. (Author)

A80-39740 * Remote sensing of coastal fronts and their effects on oil dispersion. V. Klemas (Delaware, University, Newark, Del.). *International Journal of Remote Sensing*, vol. 1, Jan.-Mar. 1980, p. 11-28. 15 refs. NSF Grant No. GI-41896; Contracts No. NAS5-21937; No. NAS5-20983.

The use of remote sensing techniques to determine the properties of coastal and estuarine fronts, which represent regions of discontinuities and high gradients in ocean physical parameters such as velocity and density, and to assess the influence of such fronts on oil pollutants is discussed. Results of an aircraft and boat verification study of an oil drift and spread model in Delaware Bay are indicated which illustrate the tendency of oil slicks to be attracted to frontal

regions, where a denser fluid underlies a lighter fluid giving rise to an inclined interface with convergence zones. Landsat imagery of the bay acquired in order to incorporate frontal information into the interactive computer model is then presented which allows the locations of coastal fronts to be charted throughout a tidal cycle. It is noted that satellite observations of flood-associated fronts on the New Jersey side of the bay and ebb-associated fronts on the Delaware side agree with boat measurements and model predictions, and that the remote tracking of fronts by aircraft and satellites will aid in oil slick clean-up operations. A.L.W.

A80-39753 # New problems of the theory of ocean tides (Novye problemy teorii okeanskikh prilivov). B. A. Kagan. *Itoqi Nauki i Tekhniki, Seriya Okeanologiya*, vol. 5, 1979, p. 78-116. 66 refs. In Russian.

The possibility of using satellite observations to study ocean tides is examined, and satellite data on the dissipation of tidal energy in the ocean are analyzed. The global interaction of ocean tides and tides in the earth crust is discussed with reference to the problem of the tidal energy budget. The unsolved problem of the parameterization of shelf effects is also considered; the importance of this problem in the numerical modeling of tides in the world ocean is indicated. B.J.

A80-39856 # Current problems of satellite oceanography (Sovremennye problemy sputnikovoi okeanologii). B. A. Nelepo (Akademiia Nauk Ukrainskoi SSR, Morskoi Gidrofizicheskii Institut, Sevastopol, Ukrainian SSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 55-63. 17 refs. In Russian.

The possibility that satellite observations can solve some of the basic theoretical and applied problems of oceanography is discussed. Three broad areas of oceanography are considered: ocean surface temperature, (2) the radiative balance of the ocean-atmosphere system, and (3) the investigation of ocean depth. The possibilities and future perspectives of satellite oceanography are reviewed. B.J.

A80-39857 # The hopes and reality of space oceanography (Nadezhdy i real'nosti kosmicheskoi okeanologii). K. N. Fedorov (Akademiia Nauk SSSR, Institut Okeanologii, Moscow, USSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 64-78. 50 refs. In Russian.

Current progress in the application of remote sensing to the study of processes in the surface layers of the ocean is reviewed; emphasis is on whether advanced remote sensing methods are adequate to solve the fundamental problems of oceanography. Particular attention is given to the use of satellite observations for the study of sea level, sea surface state, salinity, eddies, and internal waves. B.J.

A80-40019 Comments 'On the remote detection of swell by satellite radar altimeter'. R. E. Coulter (Mississippi State University, Bay Saint Louis, Miss.). *Monthly Weather Review*, vol. 108, June 1980, p. 829, 830; Reply p. 830.

A80-40025 # Regular monthly mean temperatures of earth's oceans from satellites. A. E. Strong and J. A. Pritchard (NOAA, National Environmental Satellite Service, Washington, D.C.). *American Meteorological Society, Bulletin*, vol. 61, June 1980, p. 553-559. 11 refs.

Comparisons of satellite-derived monthly mean sea surface temperature anomalies with National Marine Fisheries Service (NMFS) ship-derived monthly mean sea surface temperature anomalies over the North Pacific Ocean reveal some encouraging results. Although still far from perfect, correlation coefficients for linear fits of 0.34, 0.49, 0.50, and 0.55 are observed for the winter months of November 1977, December 1977, January 1978, and February 1978, respectively. The standard error of estimate remained close to + or - 0.6 C and the satellite-ship temperature difference between the overall monthly mean anomaly vacillated between +0.31 C (December 1977) and -0.30 C (February 1978). Several other comparisons are presented. (Author)

A80-41313 Four channel synthetic aperture radar imagery results of freshwater ice and sea ice in Lake Melville. S. K. Parashar, C. Roche, and R. D. Worsfold (Newfoundland Memorial University, St. John's, Canada). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 229-240. 14 refs.

A80-41315 Sea surface temperature and related measurements of the South Caribbean Sea utilizing GOES, NOAA and GOSSTCOMP data for locating structures. S. E. Roy (Resource Surveys International, Inc., Closter, N.J.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 261-288. 20 refs.

Data from GOES and NOAA of the South Caribbean Sea was studied from both analog facsimile and digital tapes. The results from different data processing programs were compared with GOSSTCOMP (global operational sea-surface temperature computation) temperature changes and with single pass composite alphanumeric maps, from digital analysis of GOES data, besides photographic facsimile images. The comparisons were made for determining utility in defining eddies, upwellings, and structures and their movement, formation and dissipation, over the area under study. The results demonstrate that with difficulty, it is feasible to discern temperature gradients and SST (sea surface temperature) structures, in near real time, with fair accuracy, approaching NOAA data analysis. (Author)

A80-42063 * Seasat performance evaluation - The first two steps. D. B. Lame, G. H. Born, J. A. Dunne, A. J. Spear, and C. A. Yamarone (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 72, 73. 9 refs. Contract No. NAS7-100.

Seasat, the satellite dedicated to the study of the oceans using microwave sensors, collected a data set containing information on sea surface winds, sea surface temperatures, wave heights, wave directions, internal waves, currents, tides, the marine geoid, and atmospheric water content. The first two steps of the performance evaluation of the satellite have been completed: (1) the engineering assessment and (2) the sensor evaluation. The results are encouraging for the performance of the instruments and the first level of data processing algorithms. S.D.

N80-22662*# Applied Science Associates, Inc., Apex, N. C. **RADAR ALTIMETER MEAN RETURN WAVE FORMS FROM NEAR-NORMAL-INCIDENCE OCEAN SURFACE SCATTERING Final Report**

George S. Hayne Wallops Island, Va. NASA. Wallops Flight Center Apr. 1980 27 p refs (Contract NAS6-2810) (NASA-CR-156864) Avail: NTIS HC A03/MF A01 CSCL 20N

For a nearly Gaussian transmitted pulse shape scattered from a nearly Gaussian distributed sea surface, a small argument series expansion of one term lead to a several term power series expression for the mean return waveform. Specific expressions are given for the first four terms. These results, which require less computer time than numerical convolution, are useful for data analysis from current or past radar altimeters and for design studies of future systems. Several representative results are presented for an idealized Seasat-1 radar altimeter. E.D.K.

N80-23754# Army Engineer Waterways Experiment Station, Vicksburg, Miss.

REMOTE SENSING OF AQUATIC PLANTS Final Report, Sep. 1975 - Sep. 1977

Katherine S. Long Oct. 1979 103 p refs (AD-A081737: WES-TR-A-79-2) Avail: NTIS HC A06/MF A01 CSCL 14/5

05 OCEANOGRAPHY AND MARINE RESOURCES

This report summarizes a 3 year effort in evaluating the various available remote sensing methods for identification and assessment of expanses of aquatic plants. Both materials and techniques are examined for cost effectiveness and capability to sense aquatic plants on both the local and regional scales. Computer simulation of photographic responses was employed; LANDSAT, high-altitude photography, side-looking airborne radar, and low-altitude photography were examined to determine the capabilities of each for identifying and assessing aquatic plants. Results of the study revealed LANDSAT to be the most cost effective for regional surveys, although its coarse resolution would be limiting in some cases. High-quality, high-altitude false-color infrared film showed great potential for species identification. Model studies borne out by field demonstrations showed black-and-white infrared photography to have a strong potential for discriminating infested from uninfested areas, with less associated cost than when false-color infrared is used. False-color infrared does show the greatest potential for discriminating among species. Ground-truth information concerning a specific area aids materially in the mapping. Examples of photographs, maps, and cost analyses of two demonstration projects conducted at Lake Marion, South Carolina, and Lake Seminole Florida, are included. GRA

N80-23908* Department of Energy, Mines and Resources, Ottawa (Ontario). Gravity and Geodynamics Div.
INVESTIGATION OF TIDAL DISPLACEMENTS OF THE EARTH'S SURFACE BY LASER RANGING TO GEOS-3
D. R. Bower, J. Halpenny, M. K. Paul, and A. Lambert Apr. 1980 32 p refs
(NASA-CR-156863) Avail: NTIS HC A03/MF A01 CSCL 08F

An analysis of laser ranging data from three stations was carried out in an attempt to measure the geometric Earth tide. Two different approaches to the problem were investigated. The dynamic method computes pass to pass apparent movements in stations height relative to short arcs fitted to several passes of data from the same station by the program GEODYNE. The quasi-geometric method reduces the dependence on unmodelled satellite dynamics to a knowledge of only the radial position of the satellite by considering two station simultaneous ranging at the precise time that the satellite passes through the plane defined by two stations and the center of mass of the Earth. E.D.K.

N80-23961* Phoenix Corp., McLean, Va.
VALIDATION OF OCEAN TIDE MODELS FROM SATELLITE ALTIMETRY Interim Progress Report, May - Oct. 1978
R. D. Brown 15 Oct. 1979 36 p refs
(Contract N00014-79-C-0409)
(AD-A078294) Avail: NTIS HC A03/MF A01 CSCL 08/3

Tides in the deep ocean can be determined directly from satellite altimetry, completely independent of assumptions about earth tides, bottom topography and coastal geometry and thus free of the uncertainties which plague numerical tide models. Existing tide models differ by 1 meter or more in the value of sea surface height in the deep ocean at a given place and time. This uncertainty is a formidable obstacle to determination of a precise marine geoids from satellite altimetry. By harmonic analysis of the temporal changes in altimeter measurements at satellite subtrack crossover points, it is possible to solve for the amplitude and phase of harmonic tidal components. However, care must be exercised in the removal of satellite orbit errors, and in the selection of crossovers for sufficient observability of the phase angle of the harmonic tidal component. Preliminary tidal solutions in the Gulf of Alaska using the relatively sparse GEOS-3 altimeter data distribution show generally good agreement (20 cm in amplitude and 25 degrees in phase) with deep ocean bottom pressure gauge measurements and establish the feasibility of this technique. SEASAT altimeter data yields a much greater density of crossovers (400 plus per 1/2 deg by 1/2 deg area), making possible much better separation of individual harmonic components within the semi-diurnal and diurnal families. GRA

N80-24941* National Research Inst. for Oceanology, Stellenbosch (South Africa). Physical Oceanography Div.

USE OF METEOSAT IN SOUTHERN OCEAN OCEANOLOGY AND SOUTHERN HEMISPHERE METEOROLOGY

Jre Lutjeharms Jun. 1979 30 p refs Presented at the ESA Conf. on Meteosat Usage, Darmstadt, West Germany, Jun. 1979

(CSIR-SEA-7918; ISBN-0-7988-1557-4) Avail: NTIS HC A03/MF A01

The use of Meteosat data in the refinement of weather prediction, determination of wind vectors, investigations on thunderstorms, the tracking of pollution plumes as well as in studies on the flooding of river mouths, on the water flux in and out of large lakes, and on the behaviour of ocean currents and ocean upwelling phenomena is briefly discussed. The placement of a drifting buoy in the south Atlantic Ocean using hourly thermal infrared images is also described. Some of the advantages and shortcomings of the data for oceanologic research are pointed out. M.G.

N80-25763* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

OVERSEAS TRIP REPORT, CV 990 UNDERFLIGHT MISSION

P. Gloersen, J. Crawford, and L. Hardis (OAO Corp., Beltsville, Md.) Mar. 1980 95 p refs

(NASA-TM-80662) Avail: NTIS HC A05/MF A01 CSCL 08L

The scanning microwave radiometer-7 simulator, the ocean temperature scanner, and an imaging scatterometer/altimeter operating at 14 GHz were carried onboard the NASA CV-990 over open oceans, sea ice, and continental ice sheets to gather surface truth information. Data flights were conducted over the Norwegian Sea to map the ocean polar front south and west of Bear Island and to transect several Nimbus-7 footprints in a rectangular pattern parallel to the northern shoreline of Norway. Additional flights were conducted to obtain correlative data on the cryosphere parameters and characteristics of the Greenland ice sheet, and study the frozen lakes near Barrow. The weather conditions and flight path way points for each of the nineteen flights are presented in tables and maps. A.R.H.

N80-26023* National Aeronautics and Space Administration, Wallops Flight Center, Wallops Island, Va.

GEOS-3 RADAR ALTIMETER STUDY FOR THE SOUTH ATLANTIC BIGHT

C. D. Leita, N.E. Huang, C. L. Parsons, C. G. Parra (EG and G Washington Analytical Services Center), J. D. McMill (EG and G Washington Analytical Services Center), and G. S. Hayes (Applied Sci. Associates, Inc.) May 1980 144 p refs
(Contract DI-AA551-IA8-39)

(NASA-TM-73286) Avail: NTIS HC A07/MF A01 CSCL 08C

Three years of radar altimeter data from GEOS-3 for the South Atlantic Bight were processed. Mean monthly topographic maps were produced which estimate geostrophic flow in the region. Statistical distribution of the surface wind speed and significant wave height as a function of both space and time are presented. R.E.S.

N80-26739* Instituto Geografico Nacional, Madrid (Spain).
THERMAL MAPPING, GEOTHERMAL SOURCE LOCATION, NATURAL EFFLUENTS AND PLANT STRESS IN THE MEDITERRANEAN COAST OF SPAIN Progress Report

Rodolfo Nunez delas Cuevas, Principal Investigator, Fernando Lopez Sagredo, Joaquin Melia Miralles, Pedro Herranz Araujo, Jesus Paredes Perlado, D. Antonio Parrillo, D. J. Luis Piecon, D. J. Luis Labrandero, and F. Gonzalez Bernaldez 31 Dec. 1979 41 p refs Sponsored by NASA Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(E80-10156; NASA-CR-163173; PR-2) Avail: NTIS HC A03/MF A01 CSCL 08B

N80-26744*# General Electric Co., Philadelphia, Pa.
ASSESSMENT OF THE USE OF SPACE TECHNOLOGY IN THE MONITORING OF OIL SPILLS AND OCEAN POLLUTION: EXECUTIVE SUMMARY

U. R. Alvarado, ed. Apr. 1980 68 p
 (Contract NAS1-15657)
 (NASA-CR-159243) Avail: NTIS HC A04/MF A01 CSCL 13B

The adequacy of current technology in terms of stage of maturity, of sensing, support systems, and information extraction was assessed relative to oil spills, waste pollution, and inputs to pollution trajectory models. Needs for advanced techniques are defined and the characteristics of a future satellite system are determined based on the requirements of U.S. agencies involved in pollution monitoring. A.R.H.

N80-26745*# General Electric Co., Philadelphia, Pa. Space Div.

ASSESSMENT OF THE USE OF SPACE TECHNOLOGY IN THE MONITORING OF OIL SPILLS AND OCEAN POLLUTION: TECHNICAL VOLUME. EXECUTIVE SUMMARY

U. R. Alvarado, ed., G. Chafaris, J. Chestek, J. Conrad, G. Frappel, R. Gulatsi, A. Heath, H. Hodara (Tetra Tech., Inc., Pasadena, Calif.), H. Kritikos (Pennsylvania Univ., Philadelphia), and K. Tamiyasu Apr. 1980 464 p refs
 (Contract NAS1-15657)
 (NASA-CR-159242; Doc-80SDS4203) Avail: NTIS HC A20/MF A01 CSCL 13B

The potential of space systems and technology for detecting and monitoring ocean oil spills and waste pollution was assessed as well as the impact of this application on communication and data handling systems. Agencies charged with responsibilities in this area were identified and their measurement requirements were ascertained in order to determine the spatial resolution needed to characterize operational and accidental discharges. Microwave and optical sensors and sensing techniques were evaluated as candidate system elements. Capabilities are described for the following: synthetic aperture radar, microwave scatterometer, passive microwave radiometer, microwave altimeter, electro-optical sensors currently used in airborne detection, existing space-based optical sensors, the thematic mapper, and the pointable optical linear array. A.R.H.

N80-27736# Kiel Univ. (West Germany). Inst. for Marine Research.

THE EARTH'S HYDROSPHERE AND CRYOSPHERE Final Report

W. Krauss /In ESA On Climatol., Hydrol., Atmospheric Res. and Meteorol. (CHARM) from Space Feb. 1980 p 28-34

Avail: NTIS HC A10/MF A01

The role of upper ocean circulation as a critical element in models of climatic change on the scale of weeks or decades is discussed. Emphasis is placed on the sea surface temperature as the most important quantity for climate studies, because it controls the transfer of thermal energy from the ocean to the atmosphere. It is proposed that key ocean parameters be monitored from space. Instrumentation considered includes satellite-borne altimeters, scatterometers, scanning multichannel microwave radiometers, and infrared radiometers. Both Oceanographic and ice measurements are covered. Author (ESA)

N80-27747# Institute of Oceanographic Sciences, Wormley (England).

SPACE AND TIME SCALES OF OCEAN CIRCULATION

W. J. Gould /In ESA On Climatol., Hydrol., Atmospheric Res. and Meteorol. (CHARM) from Space Feb. 1980 p 105-110 refs

Avail: NTIS HC A10/MF A01

The developments which have led to the present view of mesoscale features in the deep ocean are described. Results

illustrating the space and time scales of features studied during the mid-ocean dynamics experiment are presented. Suggestions are made for fields in which satellite data are likely to enhance knowledge of ocean circulation. Author (ESA)

N80-27748# Institute of Oceanographic Sciences, Wormley (England).

SATELLITE ALTIMETRY MEASUREMENTS OF THE SEA SURFACE

T. D. Allan /In ESA On Climatol., Hydrol., Atmospheric Res. and Meteorol. (CHARM) from Space Feb. 1980 p 113-120 refs

Avail: NTIS HC A10/MF A01

Some of the preliminary observations made with the SEASAT precise radar altimeter are reviewed. Examples are taken from recently published work on data from over the western North Atlantic where the dynamic height profiles, calculated from the available geoid model, exhibit not only a strong one to two M signal over the width of the Gulf Stream, but also smaller amplitude anomalies which are associated with mobile cold rings of some 200 km diameter. Examples of repeat profiles recorded during the period of the SEASAT frozen orbit are shown over an area in the eastern Atlantic. They exhibit a remarkable repeatability of small features in the geoid and analysis to detect possible eddies and currents is discussed. A comparison of significant wave heights measured by the altimeter and by a surface buoy is shown to agree to about 20 cm. Author (ESA)

N80-27760# Cambridge Univ. (England). Dept. of Applied Mathematical and Theoretical Physics.

OCEAN CIRCULATION

D. L. T. Anderson /In ESA On Climatol., Hydrol., Atmospheric Res. and Meteorol. (CHARM) from Space Feb. 1980 p 209-215 refs

Avail: NTIS HC A10/MF A01

Several different phenomena are discussed which have quite a large signature in sea surface elevation. Satellite altimetry is shown to have the potential for monitoring these phenomena and increasing knowledge of them. To date, only eddies have been mapped successfully by altimeters. Nonetheless, attempts should be made to try to measure other variables both at and below the ocean surface. Author (ESA)

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HYDROLOGY AND WATER MANAGEMENT

Includes snow cover and water runoff in rivers and glaciers, saline intrusion, drainage analysis, geomorphology of river basins, land uses, and estuarine studies.

A80-35186 Digital correlation of remote sensing data of mud flats (Digitale Korrelation von Fernerkundungsbildern aus Wattgebieten). B. Wrobel and M. Ehlers (Hannover, Universität, Hannover, West Germany). *Bildmessung und Luftbildwesen*, vol. 48, May 1, 1980, p. 67-79. 9 refs. In German. Deutsche Forschungsgemeinschaft Contract No. SFB-149.

The paper reports on the development of a concept for rectification on a mutual reference image in order to permit correlation of remote sensing photographs of mud flats. It is reported that different objective functions show some deviations in the results due to the unstructured topography of the mud flats. Attention is given to quality and accuracy of two chosen objective functions which are presented by examples for autocorrelation as well as unitemporal and multitemporal correlation. Finally, a prehandling of the data by geometric or densitometric treatment is shown to be necessary for increasing the available information from the image signals. M.E.P.

A80-35295 Inland /non-tidal/ wetland mapping. W. R. Stewart, V. Carter, and P. D. Brooks (U.S. Geological Survey, Reston, Va.). *Photogrammetric Engineering and Remote Sensing*, vol. 46, May 1980, p. 617-628. 6 refs.

Three experimental wetland maps prepared for the Auburndale, Fla. quadrangle are described. Wetland classes and boundaries were interpreted from quadcentered high-altitude color-infrared and super-wide black-and-white panchromatic photographs onto a black-and-white orthophoto base map from a color infrared photograph. Three wetland classification systems were tested for possible production use by U.S. Geological Survey compilers; the finished maps were compared with standard survey 1 to 24,000-scale maps. The Cowardin system was found to be best because the definitions were easier to apply in the photoidentification process, and the density and variety of wetland classes were greater than when other systems were used for classification. A.T.

A80-35296 * Enumeration of prairie wetlands with Landsat and aircraft data. D. S. Gilmer (U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Jamestown, N. Dak.), E. A. Work, Jr., J. E. Colwell, and D. L. Rebel (Michigan, Environmental Research Institute, Ann Arbor, Mich.). *Photogrammetric Engineering and Remote Sensing*, vol. 46, May 1980, p. 631-634. 16 refs. Research supported by the U.S. Fish and Wildlife Service and NASA.

A method is described for estimating wetland abundance in the 700,000 sq km prairie pothole region of North America. A double sampling procedure is described, incorporating the use of high resolution aircraft imagery, capable of delineating ponds as small as 5 m across, as a means of adjusting the count of surface water features derived from the low-resolution Landsat census over a 38,876 sq km area in east-central North Dakota. The regression expansion formula used to estimate the actual number of total wetlands is also presented. J.P.B.

A80-36244 * Permittivity and attenuation of wet snow between 4 and 12 GHz. W. I. Linlor (NASA, Ames Research Center, Moffett Field, Calif.). *Journal of Applied Physics*, vol. 51, May 1980, p. 2811-2816.

The permittivity and attenuation of prepared samples of wet snow are measured and curves presented showing the dependence of these quantities of snow wetness and frequency. Equations are given that express the experimentally determined relation between attenuation per unit length and volume-percent wetness at any frequency between 4 and 12 GHz. Additional equations are given for the calculation of permittivity from the snow density, attenuation per unit length, and frequency. Water retention characteristics of snow are described. Some applications of the techniques, such as runoff forecasting from mountain snowpacks, are proposed. (Author)

A80-38790 # The integrated use of two aerospace platforms for research on discharges of water into the sea - The case of the Tiber (L'uso integrato di due piattaforme aerospaziali per ricerche su scarichi d'acqua in mare - Il caso del Tevere). G. M. Lechi and A. Todisco (Società Italiana per il Telerilevamento, Milan, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 57-63. In Italian.

A remote sensing methodologic approach for the analysis of physical processes related to river discharges into the sea is described. The test area is the twin outfall of the Tiber River. Several surveys were performed employing Landsat and thermal aerial images simultaneously. The thermal aerial data, taken in the 9/11 micron band, were calibrated by means of simultaneous sea truth collection (temperature, salinity). An interpretation of some hydrodynamic phenomena is also presented for the days of the surveys. (Author)

A80-39852 # Glaciological research and experiments aboard the Salyut-6 orbital station (Gliatsiologicheskie issledovaniia i eksperimenty na orbital'noi stantsii 'Saliut-6'). S. V. Desinov, G. A. Nosenko, V. M. Kotliakov (Gosudarstvennyi Nauchno-Issledovatel'skii i Proizvodstvennyi Tsentr Priroda; Akademiia Nauk SSSR, Institut Geografii, Moscow, USSR), G. M. Grechko, and A. S. Ivanchenkov. *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 25-34. In Russian.

The first results of glaciological research performed aboard Salyut 6 are reviewed. Visual and photographic observations of snow cover and glaciers in the Pamir area are considered; the area was examined with regard to amount of snow, large morphological features of the ice surface, and indications of surging glaciers. Space observations made it possible to forecast glacier surges and to reveal traces of past advances; they also showed runoff from glacier-dammed lakes. Further, the studies of glacier dynamics on the northern and southern Patagonian plateaus showed abrupt changes in the marginal areas of O'Higgins, Moreno, and Braggen glaciers. This excessive activity is induced by the large glaciation energy of Patagonia and the adjacency of glacier tongues with water. B.J.

A80-41306 A remote sensing technique to monitor benthic algae. F. J. Tanis (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 101-113. Research supported by the U.S. Environmental Protection Agency.

Low altitude aircraft multispectral scanner data has been demonstrated to be useful to monitor nearshore water quality problems. Multispectral data collected on Lake Ontario were processed to show distribution of attached algae. Ground truth data as unit area samples of bottom vegetation were collected at several locations marked in the imagery by surface floats. A depth invariant model based upon principal component analysis was used to process seven passive bands between 0.46 and 0.70 m. Single features were obtained from the analysis which can be related to algal standing crop. Computer generated color maps were produced to show spatial distribution and standing crop of the benthic communities. (Author)

06 HYDROLOGY AND WATER MANAGEMENT

A80-41311 Mapping coastal wetlands of Mississippi with remote sensing. C. A. Gazzier, R. L. Frederking, and V. H. Minshew (Mississippi University, University, Miss.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 187-198. Research supported by the Mississippi Governor's Office of Science and Technology.

Coastal wetlands of Mississippi have been delineated and mapped from high altitude aircraft and Landsat imagery. Photo-mapping techniques were used to discriminate and to map seven discrete classes of coastal wetlands from high altitude false color infrared photography. Four of the delineated wetland classes correspond spatially with previously defined wetland areas which were field mapped in detail on the basis of biologic assemblage and salinity characteristics. Landsat imagery was effective for regional delineation of coastal wetlands. Color additive video enhancement of the satellite imagery provided for differentiating major groups of wetland dependent vegetation. Results of the investigation indicate that coastal wetlands can be accurately and efficiently mapped from high altitude CIR photography. Synoptic coverage afforded by Landsat provides the means to monitor time dependent change in wetland environments and to identify site specific problem areas which require immediate attention. (Author)

A80-41314 * Korean coastal water depth/sediment and land cover mapping /1:25,000/ by computer analysis of Landsat imagery. K. Y. Park and L. D. Miller (NASA, Goddard Space Flight Center, Greenbelt, Md.; Colorado State University, Fort Collins, Colo.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 241-260.

Computer analysis was applied to single data Landsat MSS imagery of a coastal area near Seoul, Korea equivalent to a 1:50,000 topographic map, and featuring large dynamic sediment transport processes. Supervised image processing yielded a test classification map containing five water depth/sediment classes, two shoreline/tidal classes and five coastal land cover classes at a scale of 1:25,000 and with a training set accuracy of 76%; the training sets were selected by direct examination of the digitally displayed imagery. The unsupervised ISOCLAS (Senkus, 1976) clustering analysis was performed to assess the relative value of this approach to image classification in areas of sparse or nonexistent ground control. Results indicate that it is feasible to produce quantitative maps for detailed study of dynamic coastal processes given a Landsat image data base at sufficiently frequent time intervals. J.P.B.

A80-41316 Monitoring of water quality and trophic states in shallow coastal lakes and estuaries - A use of Landsat imagery. C. W. Welby, A. M. Witherspoon, and R. E. Holman (North Carolina State University, Raleigh, N.C.). In: Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 289-312. 8 refs.

A80-41673 Kings Bay - Prelude to Georgia coastal zone aerial photography - 1979. D. E. Thompson (Remote Sensing Analysts, Tucker, Ga.), R. J. Reimold, and M. J. Hardisky (Georgia Department of Natural Resources, Brunswick, Ga.). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 199-214. 13 refs.

The 1978 and 1979 color infrared aerial photography project at the U.S. Navy Submarine Support Base, Kings Bay, Georgia refined marker deployment techniques precedent to the comprehensive 1979 color aerial photography program in Georgia's coastal zone. As part of the Georgia coastal zone management program, complete stereo-

scopic coverage in 23 cm x 23 cm format at a scale of 1:24,000 was intended to be obtained in 1979 and was to include all the estuarine marshes of Georgia at low tidal stage. B.J.

A80-41676 * Assessing the impact of pipeline construction on coniferous wetlands in central Michigan with aerial photography. K. M. Kittleson and M. E. McDavitt (Michigan State University, East Lansing, Mich.). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 263-275. 6 refs. Grant No. NGL-23-004-083.

The Remote Sensing Project at Michigan State University is using repetitive aerial photography to assess the impact of pipeline construction on coniferous wetlands in central Michigan. Preliminary results indicate that ponding, dieback, windthrow, and vegetation changes are readily detectable on medium-scale aerial photography. It is found that the major effect of the pipeline construction is the alteration of the water level, either by flooding or dessication. The most serious damage generally occurs when pipelines cross seepage and spring wetland types; specific damage is related to the impoundment of the natural water flow, producing flooding on the upflow side of the pipeline and dessication of these wetlands below the pipeline rights-of-way. B.J.

A80-41677 Wetlands mapping in northern Manitoba - An application of enhanced Landsat data. V. Singhroy (Nova Scotia Land Survey Institute, Lawrencetown, Canada) and B. Bruce (Department of Energy, Mines and Resources, Canada Centre for Remote Sensing, Ottawa, Canada). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 277-287. 12 refs.

This paper demonstrates a practical Landsat-based methodology for reconnaissance-level classification, inventory and mapping of wetland environments over large areas. The methodology is based on visual interpretation of optically enhanced Landsat imagery. The approach was developed for cost-effective, operational use by resource managers, within conventional mapping programs. The interpretation techniques demand close integration with first-hand field knowledge normally associated with experienced resource managers; but do not require direct access to any specialized image interpretation aids. A full-scene Landsat interpretation is presented to demonstrate the procedure. The interpretations have been verified by an extensive and rigorous field sampling program. (Author)

N80-22682# Electronics Research Lab., Adelaide (Australia). **THE INFLUENCE OF WATER TURBIDITY ON THE PERFORMANCE OF A LASER AIRBORNE DEPTH SOUNDER** D. M. Philips Apr. 1979 29 p refs (AD-A074153; ERO-0072-TR) Avail: NTIS HC A03/MF A01 CSCL 08/10

During flight trials of a laser airborne depth sounder (WRELADS), measurements were made of the optical attenuation coefficient of coastal waters in both South Australia and Queensland. Measurements of the attenuation coefficient at wavelengths from 400 nm to 600 nm are reported for a range of different water types, and the suitability for depth sounding of the laser wavelength 532 nm is confirmed. Variations of the attenuation coefficient at 530 nm over two vertical sections of sea water are reported and factors influencing the turbidity are suggested. Return signals recorded by the depth sounder are compared with measured attenuation coefficients of the water. It is shown that the maximum measurable water depth varies from below 4 to above 10 attenuation lengths, depending on the turbidity of the water. GRA

N80-23712 Utah Univ., Salt Lake City. **CATEGORIZATION OF WATERSHED LAND COVER UNITS WITH LANDSAT DATA** Ph.D. Thesis

Thomas Delane Frank 1979 187 p

Avail: Univ. Microfilms Order No. 8010660

Unsupervised training procedures were used to statistically and spatially analyze spectral variation in LANDSAT-2 MSS data for a semiarid watershed in east-central Utah. Categorization of the signatures was accomplished with a factor analysis procedure. Interclass distances among all signatures were computed, and a standardization distance matrix entered into an oblique factor analysis. Factors derived from the reduction of interclass similarities among signatures were interpreted as core land cover categories. Each of the land cover categories is an integrated terrain unit, consisting of similar vegetation and surface geology. The optimum number of integrated terrain units is readily determined. Categorization of signatures with this methodology allows a researcher to evaluate the adequacy of the signatures generated in an unsupervised training approach to actually represent land cover variation. If the optimum number of land cover categories is not known prior to classification of LANDSAT data, the basic number as represented in the LANDSAT signatures, is identified by this method which contributes to the labelling and categorization of individual signatures to the core land cover categories. Dissert. Abstr.

N80-23737*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

AUTOMATIC INTERPRETATION OF LANDSAT DATA TO CHARACTERIZE THE DISPERSION OF SUSPENDED SEDIMENTS IN ARTIFICIAL RESERVOIRS [ANALISE AUTOMATICA DE DADOS LANDSAT NO ESTUDO DA DISPERSAO DE SEDIMENTOS EM SUSPENSÃO EM RESERVATÓRIOS ARTIFICIAIS]

Nelson deJesusParada, Tania Maria Sausen, and Vitor Celso deCarvalho, Principal Investigators Sep. 1979 40 p refs In PORTUGUESE; ENGLISH summary Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (E80-10110; NASA-CR-162821; INPE-1572-RPE/071) Avail: NTIS HC A03/MF A01 CSCL 05B

N80-25734*# California Univ., Berkeley. Space Sciences Lab.

REMOTE SENSING ANALYSIS OF WATER QUALITY AND THE ENTRAPMENT ZONE IN THE SAN FRANCISCO BAY AND DELTA Final Report, 15 Mar. 1978 - 14 Aug. 1979

Robert N. Colwell, Allen W. Knight, Principal Investigators, and Siamak Khorram 14 Aug. 1979 40 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (Grant NSG-5256)

(E80-10152; NASA-CR-163169; SSL-Ser-20-Issue-42) Avail: NTIS HC A03/MF A01 CSCL 13B

The author has identified the following significant results. Data from an ocean color scanner flown on a U-2 aircraft at 65,000 ft and from LANDSAT MSS were enhanced to identify biologically active areas of San Francisco Bay, and to determine the salinity, turbidity, chlorophylls, and suspended solids. The best fit regression models for mapping water quality parameters were based on bands 3, 5, 7, and 10. Comparison of the results indicate that chlorophyll concentrations can best be estimated by the OCS or MSS data. Salinity can best be estimated by OCS data; turbidity can best be estimated by LANDSAT data. Neither OCS nor MSS data provide reliable basis for estimating suspended solids. Aerial photography of the highest quality taken with either conventional color or infrared-sensitive color films was unable to locate the biologically active areas.

N80-25739*# Bern Univ. (Switzerland). Dept. of Geography. TOPOCLIMATOLOGICAL AND SNOWHYDROLOGICAL SURVEY OF SWITZERLAND Progress Report

Matthias Winiger, Principal Investigator Apr. 1980 6 p Sponsored by NASA HCMM

(E80-10164; NASA-CR-163181; PR-2) Avail: NTIS HC A02/MF A01 CSCL 08L

The author has identified the following significant results. Low temperature zones depend on the topography and the terrain coverage type (besides the meteorological situation). The usual pattern of cold zones at the bottom of the valleys, warmer belts along the valley slopes, and cold mountain tops is modified by the terrain coverage type. Rural and forested areas normally have different surface temperatures, but along a vertical profile the temperature decrease (or increase) is often of the same order of magnitude. Because there is also a close correlation between the topography and terrain coverage (high percentage of forested areas at the valley slopes up to the timber line, much less along the valley floors), the surface temperature of the warm slope zone is increased compared to a valley profile with uniform coverage.

N80-25742*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS

Albert Rango, ed. and Ralph Peterson, ed. (GE, Beltsville, Md.) May 1980 294 p refs Workshop held at Sparks, Nev., 16-17 Apr. 1979; sponsored in part by Nevada Univ. Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (E80-10167; NASA-CP-2116) Avail: NTIS HC A13/MF A01 CSCL 08L

The history of remote sensing of snow cover is reviewed and the following topics are covered: various techniques for interpreting LANDSAT and NOAA satellite data; the status of future systems for continuing snow hydrology applications; the use of snow cover observations in streamflow forecasts by Applications Systems Verification and Transfer participants and selected foreign investigators; and the benefits of using satellite snow cover data in runoff prediction.

N80-25743*# Environmental Research and Technology, Inc., Concord, Mass.

THE EVOLUTION OF SATELLITE SNOW MAPPING WITH EMPHASIS ON THE USE OF LANDSAT IN THE SNOW ASUT STUDY AREAS

James C. Barnes and Clinton J. Bowley, Principal Investigators In NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 1-19 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

N80-25744*# National Environmental Satellite Service, Washington, D. C.

THE NOAA/NESS PROGRAM FOR OPERATIONAL SNOWCOVER MAPPING: PREPARING FOR THE 1980'S

Stanley R. Schneider, Principal Investigator In NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 21-39 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

N80-25745*# National Environmental Satellite Service, Washington, D. C.

NEW GOALS FOR SNOW MONITORING BY SATELLITE D. R. Wiesnet, Principal Investigator In NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 41-51 refs ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

06 HYDROLOGY AND WATER MANAGEMENT

N80-25746*# Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab.

MAPPING NEW ZEALAND AND ANTARCTIC SNOWPACK FROM LANDSAT

I. L. Thomas, T. D. Prowse (Canterbury Univ.), and I. F. Owens, Principal Investigators (Canterbury Univ.) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 53-72 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

N80-25747*# Zurich Univ. (Switzerland). Dept. of Geography.

DIGITAL MAPPING OF MOUNTAIN SNOWCOVER UNDER EUROPEAN CONDITIONS

Harold Haefner, Principal Investigator *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 73-91 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. A method for monitoring the snow cover in high mountain terrain such as the Swiss Alps includes the rapid classification of multitemporal data for small watersheds with very high accuracy. In addition to LANDSAT channels 4, 5, 6 and 7 an artificial channel was created containing the average altitude information of each pixel and allowing a subdivision of the watershed in accordance to the requirements of the runoff model. Even in very small watersheds of about 40 sq km the results achieved from LANDSAT data are at least as accurate as the ones gained from measurements of orthophotographs.

N80-25748*# IBM Norway, Oslo.

APPLICATION OF SATELLITE DATA FOR SNOW MAPPING IN NORWAY

H. A. Odegard, T. Andersen (Norwegian Water Resources and Elec. Board, Oslo), and G. Ostrem, Principal Investigators (Norwegian Water Resources and Elec. Board, Oslo) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 93-106 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. A close quantitative relationship was found between snow covered areas and subsequent runoff for different parts of the country despite climate differences. Digital LANDSAT data can be used for areas down to approximately 10 sq km to 20 sq km for accurate measurement of snow cover extent. On large watersheds (more than 500 sq km), digital NOAA/TIROS imagery can be used for snow mapping if the area/runoff relationship is determined by using observations from previous years.

N80-25749*# Geological Survey, Phoenix, Ariz.

SATELLITE SNOWCOVER AND RUNOFF MONITORING IN CENTRAL ARIZONA

Herbert H. Schumann, Edib Kirdar (Salt River Project), and William L. Warskow, Principal Investigators (Salt River Project) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 107-126 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. Although the very high resolution experimental LANDSAT imagery permits rapid snow cover mapping at low cost, only one observation is available very 9 days. In contrast, low resolution

operational imagery acquired by the ITOS and SMS/GOES satellites provide the daily synoptic observations necessary to monitor the rapid changes in snow covered areas in the entire Salt-Verde watershed. Geometric distortions in meteorological satellite imagery require specialized optical equipment or digital image processing for snow cover mapping.

N80-25750*# Bonneville Power Administration, Portland, Oreg. **USE OF SATELLITE DATA IN RUNOFF FORECASTING IN THE HEAVILY FORESTED, CLOUD-COVERED PACIFIC NORTHWEST**

John P. Dillard and Charles F. Orwig, Principal Investigators (Nat'l. Weather Serv., Portland, Oreg.) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 127-150 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. Satellite-derived snow cover data improves forecasts of stream flow but not at a statistically significant amount and should not be used exclusively because of persistent cloud cover. Based upon reconstruction runs, satellite data can be used to augment snow-flight data in the Upper Snake, Boise, Dworshak, and Hungry Horse basins. Satellite data does not compare well with aerial snow-flight data in the Libby basin.

N80-25751*# Soil Conservation Service, Denver, Colo.

LANDSAT DERIVED SNOWCOVER AS AN INPUT VARIABLE FOR SNOWMELT RUNOFF FORECASTING IN SOUTH CENTRAL COLORADO

B. A. Shafer and C. F. Leaf, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 151-169 refs ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

N80-25752*# Colorado Div. of Water Resources, Denver.

A GRAPHICAL METHOD OF STREAM RUNOFF PREDICTION FROM LANDSAT DERIVED SNOWCOVER DATA FOR WATERSHEDS IN THE UPPER RIO GRANDE BASIN OF COLORADO

George F. Moravec and Jeris A. Danielson, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 171-183 refs ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

N80-25753*# California State Dept. of Water Resources, Sacramento.

APPLICATION OF SNOWCOVERED AREA TO RUNOFF FORECASTING IN SELECTED BASINS OF THE SIERRA NEVADA, CALIFORNIA

A. J. Brown and J. F. Hannaford, Principal Investigators (Sierra Hydrotech) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 185-200 refs ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. Direct overlay onto 1:1,000,000 prints takes about one third the time of 1:500,000 zone transfer scope analysis using transparencies, but the consistency of the transparencies reduce the time for data analysis. LANDSAT data received on transparencies is better and more easily interpreted than the near real-time data from Quick Look, or imagery from other sources such as NOAA. The greatest potential for water supply forecasting is probably in improving forecast accuracy and in expanding forecast services during the period of snowmelt. Problems of transient snow line and uncertainties in future weather are the

main reasons that snow cover area appears to offer little in water supply forecast accuracy improvement during the period snowpack accumulation.

N80-25754*# Sierra Hydrotech, Placerville, Calif.
APPLICATION OF SATELLITE IMAGERY TO HYDROLOGIC MODELING SNOWMELT RUNOFF IN THE SOUTHERN SIERRA NEVADA

J. F. Hannaford and R. L. Hall, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 201-222 refs ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

N80-25755*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DISCHARGE FORECASTS IN MOUNTAIN BASINS BASED ON SATELLITE SNOW COVER MAPPING

J. Martinec (Federal Inst. for Snow and Avalanche Res., Davos, Switzerland) and Albert Rango, Principal Investigators *In its* Operational Appl. of Satellite Snowcover Observations May 1980 p 223-238 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57189 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. A snow runoff model developed for European mountain basins was used with LANDSAT imagery and air temperature data to simulate runoff in the Rocky Mountains under conditions of large elevation range and moderate cloud cover (cloud cover of 40% or less during LANDSAT passes 70% of the time during a snowmelt season). Favorable results were obtained for basins with area not exceeding several hundred square kilometers and with a significant component of subsurface runoff.

N80-25756*# Ecosystems International, Inc., Gambrills, Md.
COST/BENEFIT ANALYSIS FOR THE OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS (OASSO)

Peter A. Castruccio, Harry L. Loats, Jr., Donald Lloyd, and Pixie A. B. Newman, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 239-254 refs ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. The total cost associated with satellite snow cover area measurement (SATSCAM) in the Colorado ASVT was \$2,050 which equates to 0.22/sq km. When extrapolated to the 2,238,890 km area impacted by snow-survey forecasting in the Western United States, the total yearly cost of employing SATSCAM is approximately \$493k. The estimated total benefits to hydroelectric energy production is \$10m yearly, with the Pacific Northwest receiving the smallest benefits, and the Rio Grande region the highest. Irrigated agriculture receives a yearly total benefit of \$38m, with the Lower Colorado region receiving the largest per acre benefit and the Pacific Northwest receiving the lowest.

N80-25757*# National Environmental Satellite Service, Washington, D. C.

SNOW EXTENT MEASUREMENTS FROM GEOSTATIONARY SATELLITES USING AN INTERACTIVE COMPUTER SYSTEM

R. S. Gird, Principal Investigator *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 255-265 refs ERTS

(Contract NAS5-21798)

Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. A time series of GOES full resolution visible image sectors was viewed on the McIDAS video component in chronological order

and registered to within plus or minus 1 image pixel to compute real time snow melting rates. Synoptic scale clouds were eliminated to create a snow covered area from a composite image. Results show good agreement with NESS products although a significant difference was noted for one two-day period when the NESS products showed an increase in the snow cover for the Verde Basin, while the GOES/McIDAS product implied no change in the snow cover for approximately the same period. A check of NWS radar reports indicated no precipitation had occurred within the Verde basin. The use of the registered image sequence eliminates instrument error since small changes in the snow cover between any two days are easily detected.

N80-25758*# National Environmental Satellite Service, Washington, D. C.

AN ALL-DIGITAL APPROACH TO SNOW MAPPING USING GEOSTATIONARY SATELLITE DATA

J. D. Tarpley, Stanley B. Schneider, Principal Investigators, Edwin J. Danaher, and Gordon I. Myers *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 267-279 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

N80-25759*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A REVIEW OF LANDSAT-D AND OTHER ADVANCED SYSTEMS RELATIVE TO IMPROVING THE UTILITY OF SPACE DATA IN WATER-RESOURCES MANAGEMENT

V. V. Salomonson and D. K. Hall, Principal Investigators *In its* Operational Appl. of Satellite Snowcover Observation May 1980 p 281-296 refs ERTS

Avail: NTIS HC A13/MF A01 CSCL 08L

N80-26731*# National Environmental Satellite Service, Washington, D. C.

APPLICATIONS OF HCMM DATA TO SOIL MOISTURE SNOW AND ESTUARINE CURRENT STUDIES Quarterly Report

Donald R. Wiesnet, Principal Investigator, David F. McGinnis, and Michael Matson 31 Mar. 1980 3 p Sponsored by NASA

HCMM
 (E80-10144: NASA-CR-163162)

Avail: NTIS

HC A02/MF A01 CSCL 08H

N80-26732*# Environmental Research and Technology, Inc., Concord, Mass.

INVESTIGATION OF THE APPLICATION OF HCMM THERMAL DATA TO SNOW HYDROLOGY Quarterly Progress Report, 1 Jan. - 31 Mar. 1980

James C. Barnes, Principal Investigator Apr. 1980 17 p HCMM

(Contract NAS5-24316)

(E80-10145: NASA-CR-163163: QPR-10) Avail: NTIS HC A02/MF A01 CSCL 08L

The author has identified the following significant results. Analysis of HCMM digital thermal data for daytime passes over the Salt-Verde Watershed area on five dates show a gradual depletion of snow cover in the watershed (and in the Little Colorado Watershed to the north) from a maximum on February 9th to a nearly complete disappearance of the snow pack by April 15th. Temperature contours correspond closely with the snowline observed in the visible image.

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N80-26738*# South Dakota State Univ., Brookings. Remote Sensing Inst.

HCMM ENERGY BUDGET DATA AS A MODEL INPUT FOR ASSESSING REGIONS OF HIGH POTENTIAL GROUNDWATER POLLUTION Progress Report, Jan. - Mar. 1980

Donald G. Moore, Principal Investigator and J. L. Heilman Mar. 1980 7 p HCMM (Contract NAS5-24206)

(E80-10155; NASA-CR-163172; SDSU-RSI-80-03) Avail: NTIS HC A02/MF A01 CSCL 08H

The author has identified the following significant results. Day thermal data were analyzed to assess depth to groundwater in the test site. HCMM apparent temperature was corrected for atmospheric effects using lake temperature of the Oahe Reservoir in central South Dakota. Soil surface temperatures were estimated using an equation developed for ground studies. A significant relationship was found between surface soil temperature and depth to groundwater, as well as between the surface soil-maximum air temperature differential and soil water content (% of field capacity) in the 0 cm and 4 cm layer of the profile. Land use for the data points consisted of row crops, small grains, stubble, and pasture.

N80-26746*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

MICROWAVE REMOTE SENSING OF SNOWPACKS Final Report

William H. Stiles and Fawaz T. Ulaby Jun. 1980 438 p refs (Contract NAS5-23777)

(NASA-CR-3263) Avail: NTIS HC A19/MF A01 CSCL 08L

The interaction mechanisms responsible for the microwave backscattering and emission behavior of snow were investigated, and models were developed relating the backscattering coefficient (sigma) and apparent temperature (T) to the physical parameters of the snowpack. The microwave responses to snow wetness, snow water equivalent, snow surface roughness, and to diurnal variations were investigated. Snow wetness was shown to have an increasing effect with increasing frequency and angle of incidence for both active and passive cases. Increasing snow wetness was observed to decrease the magnitude sigma and increase T. Snow water equivalent was also observed to exhibit a significant influence sigma and T. Snow surface configuration (roughness) was observed to be significant only for wet snow surface conditions. Diurnal variations were as large as 15 dB for sigma at 35 GHz and 120 K for T at 37 GHz. Simple models for sigma and T of a snowpack scene were developed in terms of the most significant ground-truth parameters. The coefficients for these models were then evaluated; the fits to the sigma and T measurements were generally good. Finally, areas of needed additional observations were outlined and experiments were specified to further the understanding of the microwave-snowpack interaction mechanisms. A.R.H.

N80-26755# World Meteorological Organization, Geneva (Switzerland).

APPLICATIONS OF REMOTE SENSING TO HYDROLOGY

R. D. Wiesnet, V. G. Konovalov, and S. I. Solomon 1979 62 p refs

(WMO-513; ISBN-92-62-10513-8) Avail: NTIS HC A04/MF A01; WMO, Geneva SWFR 10

The application of remote sensing to the collection of data on surface waters and related water balance elements is considered. The principles and techniques used are reviewed and the nature of the results obtained and their application are discussed. The various types of sensor, data-transmission systems and remote-sensing platforms which are used to obtain data on different hydrological elements are described. The practical application of remote sensing of surface water, lakes, snow, glaciers, precipitation and soil moisture is discussed. Subjects such as the use of meteorological radar of natural gamma radiation for remote sensing are dealt with to a limited extent. To determine the state-of-the-art in remote sensing of hydrological elements, a questionnaire was sent to selected members on WMO. A summary of the individual replies to this questionnaire is appended. Author (ESA)

N80-27742# Centre National de la Recherche Scientifique, Grenoble (France). Lab. de Glaciologie.

ICE SHEETS, GLACIERS, AND CLIMATE

L. Lioubtry /in ESA On Climatol., Hydrol., Atmospheric Res. and Meteorol. Res. (CHARM) from Space Feb. 1980 p 67-71 refs

Avail: NTIS HC A10/MF A01

Main problems of glacier and ice sheet dynamics are reviewed. A correlation between mass balances and meteorological factors is given. The importance of unusual synoptic situations or unusual sea ice cover in June-July-August is pointed out (e.g., quaternary ice sheets may have started on shallow seas). Results show that the thickness of an ice sheet of given width is much more sensitive to mass balance and air temperatures than often assumed. Spatial geodesy is suggested as useful to check numerical calculations of flow, but can give altitude changes only in some special areas. Author (ESA)

N80-27794# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Glaciology.

INVENTORY OF SNOW COVER AND SEA ICE DATA

R. G. Crane, comp. Dec. 1979 166 p (PB80-164007; GD-7; NOAA-80022901) Avail: NTIS HC A08/MF A01 CSCL 08L

Snow cover and sea ice data were surveyed with emphasis on map series or data sets which characterize these two cryospheric parameters on a regional to global scale. Such information is of broad relevance to problems of global climate, hydrology, and environmental monitoring, as well as for operational and planning purposes in conjunction with engineering projects, transportation, agriculture, and energy assessments. The present inventory is primarily concerned with sets of large-scale snow cover data. A summary of data available from the State Snow Surveys and from a few of the regional-scale operational and experimental snow cover data sets is included. Some national data sets from non-U.S. sources are also described. The inventory of sea ice data sources focuses on mapped information relating to the seasonal cycle. GRA

DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

A80-35572 Threshold selection for line detection algorithms. C. M. Gurney (Reading, University, Reading, Berks., England). *IEEE Transactions on Geoscience and Remote Sensing*, vol. GE-18, Apr. 1980, p. 204-211. 16 refs. Research supported by the Atomic Energy Research Establishment.

Local operators are used to detect linear features in Landsat data for an area where such features are typically less than 1 pixel in width. A modification to existing techniques is made which gives improved results. The choice of threshold for the detector algorithm is investigated by considering line and background intensity, line-widths, and line alignment with respect to the pixel boundaries and spatial autocorrelation in the data set. It is found that results will always contain a significant amount of noise. Two postprocessing techniques are described which reduce this noise by utilizing contextual information in the data. (Author)

A80-36415 # The inference of GATE convective rainfall from SMS-1 imagery. W. L. Woodley, C. G. Griffith, J. S. Griffin, and S. C. Stromatt (NOAA, National Hurricane and Experimental Meteorology Laboratory, Coral Gables, Fla.). *Journal of Applied Meteorology*, vol. 19, Apr. 1980, p. 388-408. 7 refs. NOAA-supported research.

Quantitative precipitation estimates have been made for GATE from geosynchronous IR imagery, using a computer-aided technique. The present paper deals with the development and use of this technique for estimating rainfall from satellite imagery, using the A scale (in view of rain estimation on a scale of 1.4×10 to the seventh sq km). However, satellite rain estimates over smaller areas were compared with those provided independently by other investigators to establish the credibility of the satellite-derived rain estimates. The results of this research work are summarized, and some cases of interest are discussed. V.P.

A80-38600 Use of satellite data for rapid preparation of thematic maps (Einsatz von Satellitendaten zur schnellen Herstellung thematischer Karten). D. Bannert, R. W. Scholz (Bundesanstalt für Geowissenschaften und Rohstoffe, Hanover, West Germany), and G. Pöhlmann (Berlin, Technische Fachhochschule, Berlin, West Germany). *Bildmessung und Luftbildwesen*, vol. 47, Sept. 1, 1979, p. 157-160. 5 refs. In German.

A procedure is presented which allows the printing of multi-colored thematic maps within a few hours after the classification of the data on Landsat computer compatible tapes. Aspects discussed include preparatory steps towards classification, classification of digital image data, deriving printed forms from the modified magnetic tapes, and the printing of thematic maps with an abbreviated color scale. Examples for future applications are considered. In addition, a proof map is included. M.E.P.

A80-38809 # The data management for remote sensing satellites. J. P. Antikidis (ESA, Earth Observation Programme Office, Toulouse, France). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings.

Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 293-302.

Some of the efforts planned by the European Space Agency (ESA) for the development of systems in which instruments and processing are defined as a whole are presented. Attention is given to three fields of activity: quantitative information, standardization, and data management. Aspects examined include: on-board data handling, transmission, and ground acquisition and preprocessing.

M.E.P.

A80-38810 # A mathematical model for thermal inertia mapping by infrared imagery. S. R. J. Axelsson (Saab-Scania AB, Linköping, Sweden). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings.

Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 303-312. 5 refs.

A mathematical model of the surface temperature of a periodically heated half-space is developed to aid in the interpretation of thermal inertia maps obtained from infrared imagery. The analytical model, which is based on that of Watson (1975) for remote sensing applications, considers the effects of emissivity, albedo, thermal inertia, atmospheric heat exchange and the Fourier components of air temperature and incident radiation, and an explicit solution for surface temperature is obtained by linearizing the boundary conditions with a minimal error. A sensitivity analysis of the model indicates that thermal inertia is most sensitive to variations in albedo, incident radiation and atmospheric exchange, and means for correcting for the influence of these factors in the construction of an accurate thermal inertia map are suggested. A.L.W.

A80-38813 # Considerations and examples on the geometrical correction of the images acquired by the MSS system of the Landsat satellite (Considerazioni ed esempi sulla correzione geometrica delle immagini riprese dal sistema MSS del satellite Landsat). A. Moccia and S. Vetrella (Napoli, Università, Naples, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings.

Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 335-343. 7 refs. In Italian.

A description is presented of the CATART interactive digital analysis system, and particularly of geometric correction and registration procedures. Methods based on the a priori correction of well predicted errors, or a transformation using ground control points allowing the reduction of residual errors, are considered. Emphasis is placed on the a priori correction of Landsat MSS data. A practical example is presented, showing monitor, line printer, and plotter outputs of the island of Capri; attention is given to establishing the gray tone to be assigned. J.P.B.

A80-38856 # Some high-efficiency processing techniques for remotely sensed data (Alcune tecniche di elaborazione ad alta efficienza di dati di telerilevamento). V. Cappellini, M. Fondelli (Firenze, Università, Florence, Italy), F. Muntoni, and F. Vanni (Nuovo Pignone S.p.A., Florence, Italy). In: Electronic systems for remote sensing and ranging; International Scientific Congress on Electronics, 27th, Rome, Italy, March 10-12, 1980, Proceedings.

Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 345-355. 8 refs. In Italian.

Some efficient digital techniques, based on digital filtering, local space operators and data compression algorithms are presented for remotely sensed data processing. In particular it is shown how, by means of two-dimensional digital filters, it is possible to perform enhancement and noise reduction on the remotely sensed images. Furthermore, by means of some local space operators it is possible to extract boundaries and edges in order to perform, with simple pattern recognition algorithms, a clear identification and classification of different image parts. A technique based on digital filtering and decimation is also presented for the comparison and correlation of earth maps obtained from sensors at different heights (aboard aircraft or satellites). Applications of the above techniques are shown

to process aircraft photos and Landsat images for agriculture and water resource evaluations. (Author)

A80-38859 # From data to information (Dal dato all'informazione). G. Pietroforte (Inforav, Rome, Italy). In: Electronic systems for remote sensing and ranging; International Scientific Congress on Electronics, 27th, Rome, Italy, March 10-12, 1980, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 385-391. In Italian.

The arrangement of remotely sensed data in such areas as meteorology, resources, and pollution into information relevant to particular users is discussed. Emphasis is placed on the intermediate phase, wherein data entered into a computer are organized into complex information which is more useful and efficient. Primarily, the assurance that the data are recorded maintaining their original nature as well as providing dynamic responses to the specific requirements of the users is considered. J.P.B.

A80-39211 Recommended modification of LOWTRAN 4 to include first order solar scattering. L. L. Smith, J. Krassner, W. G. Egan, T. W. Hilgeman, and J. E. A. Selby (Grumman Aerospace Corp., Bethpage, N.Y.). In: Atmospheric effects on radiative transfer; Proceedings of the Seminar, San Diego, Calif., August 29, 30, 1979. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 60-69. 13 refs.

The atmospheric transmittance and radiance code LOWTRAN 4 is modified to include first order scattering of sunlight into the line of sight. This scattering becomes important for wavelengths shorter than 5 microns under daytime conditions. The radiance due to both aerosol and molecular scattering is combined with atmospheric extinction and thermal emission already contained in the model. A mean phase function is defined by averaging over a given aerosol size distribution, composition, and wavelength in order to simplify the calculations. A comparison of the model with observational data is presented. (Author)

A80-39711 Automatic change detection for synthetic aperture radar images. J. Keng (Lockheed Research Laboratories, Palo Alto, Calif.). In: Applications of digital image processing III; Proceedings of the Seminar, San Diego, Calif., August 27-29, 1979. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 125-128.

The detection of changes between two images is of interest in a wide range of applications. An important example is side-looking Synthetic Aperture Radar (SAR) imagery taken at different times. A method called Symbolic Matching with Confidence Evaluation is proposed to perform automatic change detection for SAR images. The results of the preliminary experiments have been very promising and will be presented. (Author)

A80-39741 SAR processing of partially coherent phenomena. R. K. Raney (Department of Energy, Mines and Resources, Canada Centre for Remote Sensing, Ottawa, Canada). *International Journal of Remote Sensing*, vol. 1, Jan.-Mar. 1980, p. 29-51. 9 refs. Research supported by the Department of Energy, Mines, and Resources.

The general problem of a partially coherent synthetic aperture radar (SAR) imaging a scene that is subjected to random fade is considered. The impulse response, frequency response and response to extended random fields are formally derived. Explicit results are obtained using gaussian functions to describe the SAR, its coherence and the scene coherence. Results converge appropriately on known results for cases treated previously. New results are presented concerning all three classes of fading input scenes. The results are applied to the problem of SAR imagery of oceanic waves, with comments on certain aspects of Seasat-A SAR data as appropriate. (Author)

A80-39744 Relative reflectance data from preprocessed multispectral photography. P. Curran (Reading, University, Reading, Berks., England). *International Journal of Remote Sensing*, vol. 1, Jan.-Mar. 1980, p. 77-83. 12 refs. Natural Environment Research Council Grant No. GR-3/1481.

A preprocessing methodology for the acquisition of quantitative relative reflectance data from multispectral multitemporal photography is proposed. The technique serves to suppress frame-to-frame and date-to-date variability, which influence the relationship between reflectance and photographic image tone, by the steps of gamma standardization, scene-to-scene ratioing and band-to-band ratioing. An example of the preprocessing of ground-level and aerial photography of four types of vegetation cover taken at regular intervals demonstrates the close covariance of the data sets with respect to each other and to seasonal variations in biomass and ground cover. The methodology has applications in all situations requiring quantitative relative reflectance data to be obtained economically from photographic data. A.L.W.

A80-39853 # Development of methods and tools for subsatellite observations (Razvitiye metodov i sredstv podsputnikovykh nabludeni). T. K. Ismailov (Akademiia Nauk Azerbaidzhanskoi SSR, Institut Kosmicheskikh Issledovani Prirodnikh Resursov, Baku, Azerbaidzhan SSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 35-39. In Russian.

The principles of a subsatellite system for the remote sensing of earth resources are reviewed, with attention given to the thematic interpretation of large files of remote sensing data and the detailed investigation of polygon characteristics. As an example, the features of a subsatellite service introduced in the Caucasus-Caspian area are described. B.J.

A80-39854 # The development and utilization of aerospace studies of natural phenomena and resources in Siberia and the Far East (Razvitiye i ispol'zovanie aerokosmicheskikh issledovani prirodnikh iavlenii i resursov v Sibiri i na Dal'nem Vostoke). A. L. Ianshin and L. K. Ziat'kova (Akademiia Nauk SSSR, Institut Geologii i Geofiziki, Novosibirsk, USSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 40-48. 30 refs. In Russian.

The use of aerial and space photographic data for the investigation of natural resources and processes in Siberia and the Far East is reviewed. Attention is given to biological, geological, and geographical investigations, and to the processing and thematic interpretation of remote sensing data by means of computer systems. B.J.

A80-39859 # Thematic interpretation of multispectral space photographs (Tematicheskoe deshifirovanie mnogozonal'nykh kosmicheskikh snimkov). Iu. F. Knizhnikov and V. I. Kravtsova (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 88-94. 11 refs. In Russian.

The advantages and disadvantages of multispectral space photography are reviewed, along with a brief history of its application, and specific features of the interpretation of multispectral imagery. Four major approaches to data handling are assessed: (1) the interpretation of selected spectral images, (2) the interpretation of color transparencies, (3) the successive interpretation of a multispectral image series, and (4) the comparative interpretation of the multispectral series on the basis of the object's spectral signature. B.J.

A80-40831 Remote sensing and image interpretation. T. M. Lillesand (Minnesota, University, Minneapolis, Minn.) and R. W. Kiefer (Wisconsin, University, Madison, Wis.). New York, John Wiley and Sons, Inc., 1979. 624 p. 166 refs. \$26.95.

The book has been prepared for use in remote sensing and image interpretation studies. It focuses on remote sensing systems and illustrates their utility in a diverse range of data gathering applications. The book is divided into 10 chapters: (1) concepts and foundations of remote sensing; (2) elements of photographic

systems; (3) introduction to airphoto interpretation; (4) airphoto interpretation for terrain evaluation; (5) photogrammetry; (6) radiometric characteristics of aerial photographs; (7) aerial thermography; (8) multispectral scanning and spectral pattern recognition; (9) microwave sensing; and (10) remote sensing from space. Image sources are given in an appendix. S.D.

A80-40836 Landsat image processing. E. E. Triendl (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, West Germany). In: *Advances in digital image processing: Theory, application, implementation; Proceedings of the International Symposium, Bad Neuenahr, West Germany, September 26-28, 1978.* New York, Plenum Press, 1979, p. 165-175.

Landsat image processing is reviewed, with attention given to the multispectral scanner, and the geometric and radiometric properties of multispectral scanner pictures. It is noted that geometric rectification and pixel by pixel classification of Landsat MSS imagery are fairly well understood. More advanced methods of picture segmentation are very promising but still in the development stage. B.J.

A80-41296 # Problems of the aerial and space spectrometry of the earth surface (Problemy aerokosmicheskoi spektrometrii zemnoi poverkhnosti). G. A. Avanesov (Akademii Nauk SSSR, Institut Kosmicheskikh Issledovaniy, Moscow, USSR). *Issledovanie Zemli iz Kosmosa*, Mar.-Apr. 1980, p. 66-75. 12 refs. In Russian.

The development of automatic image processing systems for remotely sensed data is considered with emphasis on the interpretation of multispectral data. Attention is given to the development of a data bank which would relate the spectral energy and textures of objects with their physical and chemical characteristics. The physical, methodological, and technical aspects of the problem are discussed. B.J.

A80-41302 Distributed processing system for remotely sensed data analysis in developing nations. H. L. Wagner (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: *Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.* Tullahoma, Tenn., University of Tennessee, 1980, p. 17-21.

A distributed processing system for remotely sensed data is proposed which consists of a large time-shared computer mainframe for the bulk of image manipulation and processing, and a small microprocessor-based intelligent terminal for image display and interpretation. Features of the system include portability enabling in-field use and low cost. Consequently, a user could obtain processed imagery at remote locations either by telephone links or satellite relay. J.P.B.

A80-41303 A French satellite for remoting sensing - A study of the geometric quality of the images. A. P. Esterle and R. C. Rosso (Centre National d'Etudes Spatiales, Toulouse, France). In: *Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers.* Tullahoma, Tenn., University of Tennessee, 1980, p. 31-44. 6 refs.

The SPOT remote sensing satellite project is described, including its mission, orbit, payload and image station; a complete coverage of the earth's surface will be made in 26 days, and two HRV scanning instruments will be used. In order to assess the geometric quality of the images obtained, a computer simulation was carried out which gave the sensitivity of the images to different parameters. After correction the images are scaled to ensure the superposability on a reference map. Results indicate that the scales will be 1:1,000,000 after preprocessing, and 1:500,000 or 1:250,000 according to whether three or nine ground control points are used. J.P.B.

A80-41665 Site-specific mapping of surface temperature based on NOAA-5 satellite VHRR data. S. Khorram and H. G. Smith (California, University, Berkeley, Calif.). In: *Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers.* Tullahoma, Tenn., University of Tennessee, 1980, p. 61-72. 5 refs.

The procedure used in this study involved: (1) geometric correction of the satellite data, because of distortions caused by curvature of the earth's surface, earth rotation and satellite movement; (2) temperature calibration; (3) coordinate transformation for compatibility with other data sources; and (4) preparation of temperature maps with watershed boundaries on them. This procedure has been applied to the study area for several dates during the spring of 1978. Output products include geometrically corrected thermal imagery, temperature maps, statistical summaries and tabulated temperature values for the entire study area. The output products are presently being implemented into selected net radiation and hydrologic models. (Author)

A80-41671 The errors associated with digital resampling of Landsat forest imagery for multirate registration. T. L. Logan (Informatics, Inc., Pasadena, Calif.) and A. H. Strahler (California, University, Santa Barbara, Calif.). In: *Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers.* Tullahoma, Tenn., University of Tennessee, 1980, p. 163-180.

The degradation of Landsat imagery by resampling for registration (or rectification) was found to vary considerably depending on whether the cubic convolution, bilinear, or nearest neighbor technique was used. In a 220 sq km study area located within California's Klamath National Forest, the cubic convolution technique was found to introduce the least amount of error in twice-resampled imagery, with 14% of Band 5 pixels and 22% of Band 7 pixels altered by 3 density numbers (DN) or more. This compares to 35% and 44%, respectively, for the same imagery resampled with the bilinear algorithm. Nearest neighbor sampling best preserved the original histogram of DN values, but proved unfit for multirate registration owing to poor spatial relocation of pixels. B.J.

A80-41764 # The microwave remote sensing experiment for the first Spacelab payload. W. Wodzak (Dornier System GmbH, Friedrichshafen, West Germany) and M. Wahl (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Cologne, West Germany). *Deutsche Gesellschaft für Luft- und Raumfahrt und American Astronautical Society, Symposium on Shuttle/Spacelab - The New Transportation System and its Utilization, 3rd, Hanover, West Germany, Apr. 28-30, 1980, DGLR Paper 80-090.* 24 p.

The organization and block diagram of a Spacelab remote sensing experiment are examined. The discussion is centered on the three basic modes of the experiment - the two-frequency (2 FS) mode for obtaining ocean wave spectra; the SAR (Synthetic Aperture Radar) mode, aimed at obtaining data for processing earth images with a resolution on the order of 25 m; and the radiometer mode, intended to support the two previous modes by measuring the 9.6 GHz radiation of the earth. V.P.

N80-23715* Lockheed Electronics Co., Houston, Tex. Systems and Services Div. **TEXAS NATURAL RESOURCES INVENTORY AND MONITORING SYSTEM (TNRIMS), APPLICATIONS SYSTEM VERIFICATION AND TRANSFER (ASVT), REMOTE SENSING INFORMATION SUBSYSTEM (RSIS): USER'S GUIDE** A. M. Falls, Principal Investigator Dec. 1979 77 p ERTS (Contract NAS9-15800) (E80-10088: NASA-CR-160531; LEC-14286: JSC-16436) Avail: NTIS HC A04/MF A01 CSCL 08F

N80-23716*# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

A METHOD FOR CLASSIFYING MULTISPECTRAL REMOTE SENSING DATA USING CONTEXT

Philip H. Swain, Howard J. Siegel, and Bradley W. Smith, Principal Investigators 1979 11 p refs Presented at the Machine Process of Remotely Sensed Data Symp., 1979 ERTS (Contract NAS9-15466)

(E80-10089; NASA-CR-160477; Rept-062379) Avail: NTIS HC A02/MF A01 CSCL 05B

N80-23717*# Lockheed Electronics Co., Houston, Tex. **OPERATIONS MANUAL FOR THE LANDSAT IMAGERY, VERIFICATION AND EXTRACTION SYSTEM (LIVES)**

L. E. Giddings, Principal Investigator Aug. 1979 83 p ERTS (Contract NAS9-15800)

(E80-10090; NASA-CR-160475; LEC-12903; JSC-14633) Avail: NTIS HC A05/MF A01 CSCL 05B

N80-23718*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

USERS MANUAL FOR THE LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM (LIVES)

L. E. Giddings, Principal Investigator Aug. 1979 52 p ERTS (Contract NAS9-15800)

(E80-10091; NASA-CR-160474; LEC-12902; JSC-14632) Avail: NTIS HC A04/MF A01 CSCL 05B

N80-23723*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

TEXAS NATURAL RESOURCES INVENTORY AND MONITORING SYSTEM (TNRIMS), APPLICATIONS SYSTEM VERIFICATION AND TRANSFER (ASVT), REMOTE SENSING INFORMATION SUBSYSTEM (RSIS): UNIVAL SOFTWARE USER'S GUIDE

A. S. Story and M. V. Martin, Principal Investigators Dec. 1979 55 p ERTS

(Contract NAS9-15800) (E80-10096; NASA-CR-160532; LEC-14287; JSC-16437) Avail: NTIS HC A04/MF A01 CSCL 08F

N80-23724*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

TEXAS NATURAL RESOURCES INVENTORY AND MONITORING SYSTEM (TNRIMS), APPLICATIONS SYSTEM VERIFICATION AND TRANSFER (ASVT), REMOTE SENSING INFORMATION SUBSYSTEM (RSIS): ACCEPTANCE TEST PROCEDURES

M. L. Brown, M. V. Martin, and A. S. Story, Principal Investigators Dec. 1979 52 p ERTS

(Contract NAS9-15800) (E80-10097; NASA-CR-160533; LEC-14288; JSC-16438) Avail: NTIS HC A04/MF A01 CSCL 08F

N80-24730# Army Engineer Topographic Labs., Fort Belvoir, Va.

DETECTION OF SIGNAL SIGNATURES OF CARTOGRAPHIC FEATURES

Pi-Fuay Chen and William Seemuller 17 Jan. 1980 19 p refs

(AD-A082235; ETL-R006) Avail: NTIS HC A02/MF A01 CSCL 08/2

A semi-automated technique was developed for extracting and recognizing cartographic features, such as, road intersections, straight line roads, and rectangular objects from aerial photographs.

The method uses the Walsh transform processing technique, and was implemented with an electronic experimental system consisting of a solid-state sensor array, a minicomputer, and a computer-controlled translational stage as the imagery holder. Successful experimental results were obtained for a selected set of cartographic features of the types described above. This feature extractor will be integrated in parallel with other feature extractors, which are to be developed in the future, to become a total automated feature extraction system. A method for detecting the decomposed signal signatures representing cartographic features using analog processors is described. Finally, conclusions are given. GRA

N80-24738# Royal Aircraft Establishment, Farnborough (England).

GEOMETRIC CORRECTION OF SATELLITE IMAGERY

J. M. Williams London HMSO Sep. 1979 31 p refs (RAE-TR-79121; RAE-Space-569; BR72781) Avail: NTIS HC A03/MF A01

Imagery from LANDSAT and other remote sensing satellites suffers geometric distortion which requires correction. How ground control points can be used to determine the transformation between image coordinates and some known projection is described. These ground control points were located in the image and on a standard map, here a 1:50,000 ordnance survey map. Suitable models for performing the transformation and various interpolation techniques for resampling the transformed image are examined. As results, a set of photographic images is included to show the effects of the processing methods described.

Author (ESA)

N80-25021*# Science Systems and Applications, Inc., Lanham, Md.

A COMPUTER ALGORITHM FOR PERFORMING INTERACTIVE ALGEBRAIC COMPUTATION ON THE GE IMAGE-100 SYSTEM Final Report

William D. Hart and H. H. Kim 1979 32 p refs

(Contract NAS5-25113) (NASA-CR-159985) Avail: NTIS HC A03/MF A01 CSCL 09B

A subroutine which performs specialized algebraic computations upon ocean color scanner multispectral data is presented. The computed results are displayed on a video display. The subroutine exists as a component of the aircraft sensor analysis package. The user specifies the parameters of the computations by directly interacting with the computer. A description of the conversational options is also given. M.G.

N80-26059# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil). **ALGORITHMS FOR SAMPLE CLASSIFICATION AND IMAGE FEATURE SELECTION [ALGORITMOS PARA CLASSIFICACAO DE AMOSTRAS E SELECAO DE ATRIBUTOS DE IMAGENS]**

Carlos Roberto deSouza, Luiz Rogerio deCamargos, Ravindra Kumar, and Nelson D. A. Mascarenhas Apr. 1980 88 p refs In PORTUGUESE: ENGLISH summary

(INPE-1718-RPE/124) Avail: NTIS HC A05/MF A01

Two algorithms are described for sample classification in Earth resources multispectral imagery. The first one uses the JM-distance, while the second one is based on the maximum likelihood criterion. A feature selection algorithm was also implemented under the following criteria: average JM-distance and minimum JM-distance. A.R.H.

N80-26060# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil). **PARTITIONING MULTISPECTRAL IMAGERY OF THE EARTH RESOURCES [PARTICIONAMENTO DE IMAGENS MULTIESPECTRAIS DE RECURSOS NATURAIS DA TERRA]**

Walter Kenkiti Takahashi, Adael Woods DecFilho, and Ravindra Kumar Feb. 1980 65 p refs In PORTUGUESE: ENGLISH summary

(INPE-1678-RPE/111) Avail: NTIS HC A04/MF A01

An efficient algorithm is described for partitioning multispectral Earth resources imagery. Statistically homogeneous objects are extracted, for posterior classification. A.R.H.

N80-26715*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

TEXAS NATURAL RESOURCES INVENTORY AND MONITORING SYSTEM (TNRIMS), APPLICATIONS SYSTEM VERIFICATION AND TRANSFER (ASVT), REMOTE SENSING INFORMATION SUBSYSTEM (RSIS): AS BUILT FUNCTIONAL DESIGN

M. L. Brown, A. M. Fails, M. V. Martin, A. S. Story, and E. A. Weisblatt, Principal Investigator Jan. 1980 115 p ERTS
(Contract NAS9-15800)
(E80-10125; NASA-CR-160561; LEMSCO-13258; JSC-16458)
Avail: NTIS HC A06/MF A01 CSCL 05B

N80-26720*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

AN EXAMINATION OF SPECTRAL BAND RATIONING TO REDUCE THE TOPOGRAPHIC EFFECT ON REMOTELY SENSED DATA

Brent Holben and Chris Justice, Principal Investigator Feb. 1980 34 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E80-10133; NASA-TM-80640) Avail: NTIS HC A03/MF A01 CSCL 14E

N80-26724*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

EARTH OBSERVATIONS DIVISION VERSION OF THE LABORATORY FOR APPLICATIONS OF REMOTE SENSING SYSTEM (EOD-LARSYS) USER GUIDE FOR THE IBM 370/148. VOLUME 1: SYSTEM OVERVIEW

P. J. Aucoin and J. Stewart, Principal Investigator Aug. 1978 226 p ERTS
(Contract NAS9-15200)
(E80-10137; NASA-CR-160595; LEC-12563-Vol-1; JSC-13821-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 05B

N80-26725*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

EARTH OBSERVATIONS DIVISION VERSION OF THE LABORATORY FOR APPLICATIONS OF REMOTE SENSING SYSTEM (EOD-LARSYS) USER GUIDE FOR THE IBM 370/148. VOLUME 2: USER'S REFERENCE MANUAL

P. J. Aucoin, Principal Investigators and J. Stewart Dec. 1978 307 p refs ERTS
(Contract NAS9-15200)
(E80-10138; NASA-CR-160594; LEC-12564-Vol-2; JSC-13821-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 05B

N80-26726*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

EARTH OBSERVATIONS DIVISION VERSION OF THE LABORATORY FOR APPLICATIONS OF REMOTE SENSING SYSTEM (EOD-LARSYS) USER GUIDE FOR THE IBM 370/148. VOLUME 4: PROGRAM LISTINGS

M. L. Burnell and P. J. Aucoin, Principal Investigator Jan. 1979 527 p ERTS
(Contract NAS9-15800)
(E80-10139; NASA-CR-160592; LEC-12565-Vol-4; JSC-13821-Vol-4) Avail: NTIS HC A23/MF A01 CSCL 05B

N80-26727*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

EARTH OBSERVATIONS DIVISION VERSION OF THE LABORATORY FOR APPLICATIONS OF REMOTE SENSING SYSTEM (EOD-LARSYS) USER GUIDE FOR THE IBM 370/148. VOLUME 4: PROGRAM LISTINGS

M. L. Burnell and P. J. Aucoin, Principal Investigator Nov. 1979 535 p Revised ERTS
(Contract NAS9-15800)
(E80-10140; NASA-CR-160572; LEC-12566-Rev-A; JSC-13821-Rev-A) Avail: NTIS HC A23/MF A01 CSCL 05B

N80-26737*# Environmental Research Inst. of Michigan, Ann Arbor.

LANDSAT TECHNOLOGY TRANSFER USING COMMUNITY COLLEGES Progress Report, Jan. - Apr. 1980

Robert H. Rogers, Principal Investigator May 1980 48 p ERTS
(Contract NASw-3308)
(E80-10154; NASA-CR-163171; ERIM-147200-4-P) Avail: NTIS HC A03/MF A01 CSCL 05B

N80-26748# Geological Survey, Washington, D. C.

INTRODUCTION TO MONITORING DYNAMIC ENVIRONMENTAL PHENOMENA OF THE WORLD USING SATELLITE DATA COLLECTION SYSTEMS, 1978

William D. Carter and Richard W. Paulson 1979 26 p refs (Circ-803) Avail: NTIS HC A03/MF A01

Satellite telemetry systems that can collect and transmit environmental data from remote regions of the world to regional resources information centers are described. The features and limitations of global information systems are discussed with respect to instrumentation. R.C.T.

N80-26758# New Mexico Univ., Albuquerque.

REMOTE SENSING: PHOTOINTERPRETATION TECHNIQUES OF LANDSAT DATA. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1977 - Jan. 1980

Robert W. Gonzales Mar. 1980 40 p Sponsored in cooperation with NASA and NTIS
(PB80-805484) Avail: NTIS HC \$30.00/MF \$30.00 CSCL 14E

Various aspects of photointerpretation of LANDSAT data are considered in 152 abstracts of reports on photomapping, geologic and soil investigations, effect of vegetation on rock and soil, ecological land classification, forestry, terrain and crop analysis, and additive viewing as an interpretation technique. GRA

N80-27096# Amsterdam Univ. (Netherlands). Fysisch Geografisch en Bodemkundig Lab.

THE COMPUTER IN PHYSICAL GEOGRAPHY [DE COMPUTER IN DE FYSISCH GEOGRAFIE]

1979 118 p refs In DUTCH Proc. held in Amsterdam, 14 Apr. 1978

Avail: NTIS HC A06/MF A01

Topics include: computerized modeling and simulation, image processing of satellite photographs, on-line literature searching, processing of metrology data, and statistical analysis of geographical data.

N80-27768*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

AS-BUILT SPECIFICATION FOR THE ERIM TAPE CONVERSION TO LARSYS 2 PROGRAM (ECTL2)

L. F. Robinson, Principal Investigator Dec. 1976 25 p ERTS

07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

(Contract NAS9-12200)

(E80-10202: NASA-CR-160614: LEC-9857: JSC-11833) Avail:
NTIS HC A02/MF A01 CSCL 05B

N80-27773*# Lockheed Engineering and Management Services
Co., Inc., Houston, Tex.

**A NOTE ON THE GENERATION OF POISSON-DISTRIBUTED
RANDOM NUMBERS WITH LARGE MEAN**

George R. Terrell, Principal Investigator Apr. 1980 11 p refs
ERTS

(Contract NAS9-15800)

(E80-10224: NASA-CR-160656) Avail: NTIS
HC A02/MF A01 CSCL 12A

N80-27775*# Lockheed Engineering and Management Services
Co., Inc., Houston, Tex.

**EARTH OBSERVATIONS DIVISION VERSION OF THE
LABORATORY FOR APPLICATIONS OF REMOTE SENSING
SYSTEM (EOD-LARSYS) USER GUIDE FOR THE IBM
370/148. VOLUME 3: AS-BUILT DOCUMENTATION
(SECTIONS 1-12)**

M. L. Burnell and P. J. Aucoin, Principal Investigators Apr.
1980 349 p ERTS

(Contract NAS9-15800)

(E80-10226: NASA-CR-160658: LEMSCO-12565-Rev-A;
JSC-13821-Rev-A) Avail: NTIS HC A15/MF A01 CSCL
05B

N80-27776*# Lockheed Engineering and Management Services
Co., Inc., Houston, Tex.

**EARTH OBSERVATIONS DIVISION VERSION OF THE
LABORATORY FOR APPLICATIONS OF REMOTE SENSING
SYSTEM (EOD-LARSYS) USER GUIDE FOR THE IBM
370/148. VOLUME 3: AS-BUILT DOCUMENTATION
(SECTIONS 13-23)**

M. L. Burnell and P. J. Aucoin, Principal Investigators Apr.
1980 442 p ERTS

(Contract NAS9-15800)

(E80-10227: NASA-CR-160659: LEMSCO-12565-Rev-A;
JSC-13821-Rev-A) Avail: NTIS HC A19/MF A01 CSCL
05B

INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

A80-33337 * # Microwave radar and radiometric remote sensing measurements of lake ice. C. T. Swift, W. L. Jones, Jr., R. F. Harrington, J. C. Fedors, R. H. Couch (NASA, Langley Research Center, Hampton, Va.), and B. L. Jackson (Old Dominion University, Norfolk, Va.). *Geophysical Research Letters*, vol. 7, Apr. 1980, p. 243-246. 11 refs.

Simultaneous microwave radar and spectral radiometric data were collected over Lake Erie during March 1978. A theoretical development is presented which interprets the data collected at nadir in terms of changes in the ice thickness and the electromagnetic attenuation coefficient. The theory also addresses the failure of the spectral radiometer to determine ice thickness through observations of quarter wavelength excursions in the reflectivity. Radar data collected off-nadir showed a substantially different behavior compared to that collected near nadir. This difference is attributed to a change in propagation characteristics from quasi-specular return from the ice-water interface to scattering from the rough air-ice interface.

(Author)

A80-35298 The field measurement of reflectance factors. M. J. Duggin (New York, State University, Syracuse, N.Y.). *Photogrammetric Engineering and Remote Sensing*, vol. 46, May 1980, p. 643-647. 10 refs.

The literature contains reflectance factors which have been obtained in many different ways and which often disagree. The major error sources may be eliminated by using a simple relative measurement technique in which two radiometers are employed to measure simultaneously irradiance on the ground and radiance reflected from it. It is essential that the calibration between these radiometers and its dependence on sun angle be understood. This report deals with the problems of measurement, calibration, and analysis. Special emphasis is placed upon measurements made in the Landsat bandpasses.

(Author)

A80-36160 # The distant geomagnetic tail observing satellite Geos-3. K. Knott (ESA, Space Science Dept., Noordwijk, Netherlands). *ESA Journal*, vol. 4, no. 1, 1980, p. 1-14.

The scientific rationale and mission objectives of a satellite devised to observe the geomagnetic tail at distances beyond 100 earth radii are examined. A discussion of the scientific payload covers the magnetometer, the high-energy-particle spectrometer, the gamma-ray burst detector, and plasma-mantle, plasma-sheet, plasma-composition, and wave-field experiments. The operational configuration of the Geos-3 is illustrated and described.

V.P.

A80-37405 * # An algorithm for retrieval of ocean surface and atmospheric parameters from the observations of the scanning multichannel microwave radiometer. T. T. Wilheit and A. T. C. Chang (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Radio Science*, vol. 15, May-June 1980, p. 525-544. 30 refs.

The scanning multichannel microwave radiometer is a five-frequency (6.6, 10.7, 18, 21, and 37 GHz), dual-polarized microwave radiometer, which was launched in two separate satellites, Nimbus 7 and Seasat, in 1978. A formalism is developed which can be used to interpret the data in terms of sea surface temperature, sea surface wind speed, and the atmospheric content of water vapor and liquid water. It is shown with reasonable instrumental performance assumptions that these parameters can be derived to useful accuracy.

Although the algorithms are not derived for use in rain, it is shown that at least token rain rates can be tolerated without invalidating the retrieved geophysical parameters.

(Author)

A80-37774 * Some considerations in the evaluation of Seasat-A scatterometer /SASS/ measurements. I. Halberstam (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Journal of Physical Oceanography*, vol. 10, Apr. 1980, p. 623-632. 28 refs. Contract No. NAS7-100.

A study is presented of the geophysical algorithms relating the Seasat-A scatterometer (SASS) backscatter measurements with a wind parameter. Although these measurements are closely related to surface features, an identification with surface layer parameters such as friction velocity or the roughness length is difficult. It is shown how surface truth in the form of wind speeds and coincident stability can be used to derive friction velocity or the equivalent neutral wind at an arbitrary height; it is also shown that the derived friction velocity values are sensitive to contested formulations relating friction velocity to the roughness length, while the derived values of the equivalent neutral wind are not. Examples of geophysical verification are demonstrated using values obtained from the Gulf of Alaska Seasat Experiment; these results show very little sensitivity to the type of wind parameter employed, suggesting that this insensitivity is mainly due to a large scatter in the SASS and surface truth data.

A.T.

A80-38795 # Operation of the microwave remote sensing experiment /MRSE/. M. Werner and R. Fiedler (Deutsche Forschung- und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, West Germany). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, *Proceedings*.

Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 107-116.

The use of a multimode microwave sensor on Spacelab, with high data rates, automatization and a good interrupt possibility is discussed. The microwave remote sensing experiment (MRSE) consists of a microwave radar instrument in the X-band (9.65 GHz) with three experiment operation modes. In the first mode, MRSE operates as a two-frequency scatterometer for remote measurements of the ocean wave spectrum; the second mode is a high resolution synthetic aperture radar with all-weather earth surface imaging capability for hydrology, agriculture and cartography, and the passive mode is a Dicke radiometer measuring the microwave brightness temperature of the antenna footprint. The operation sequence, control and monitoring techniques, data handling and ground operations are discussed.

J.P.B.

A80-38804 # Programs of spaceborne remote sensing of the Consiglio Nazionale delle Ricerche (Programmi di teleosservazioni spaziali del Consiglio Nazionale delle Ricerche). C. Albanesi (CNR, Servizio Attività Spaziali, Rome, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, *Proceedings*.

Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 231-235. In Italian.

Remote sensing programs of the U.S. (Landsat D), of ESA regarding agriculture, water resources, fishing and the marine environment, and of France and Germany are discussed, together with the national space plan of Italy. A feasibility study regarding the technology of microwave sensors is reported. Emphasis is placed on a pilot project for using remote sensing to determine water resources in relation to agrarian and forest productivity. The objects of the research include defining hydrogeologic balances, measuring evapotranspiration, evaluating thermal and water conditions of vegetation and of the terrain, and determining agrometeorological areas with regard to cultivation.

J.P.B.

A80-39125 Statistical scene study of Skylab infrared data. E. M. Winter (IBM Corp., Westlake Village, Calif.). In: Modern utilization of infrared technology V; Proceedings of the Fifth Annual Seminar, San Diego, Calif., August 29, 30, 1979. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 225-232. 6 refs.

Four S-192 conical multisensor data sets acquired during the 1973-1974 Skylab mission were investigated from the standpoint of the statistical properties of the scenes themselves. These S-192 data sets contained scene data not normally acquired by aircraft-based remote sensors; but represented in the data sets were several cloud types, coastal mountains, snow covered mountains and valleys, and ocean backgrounds. The data sets were studied by choosing areas of homogeneous background and obtaining the power spectral density (PSD). The statistics of like areas were compared, noting the effect of optically thin and thick clouds on the statistics of terrain backgrounds; the PSD's based on the Skylab-192 will be presented and infrared and statistical measures for specific background classes were discussed. A.T.

A80-39860 # Remote sensing methods for investigating the earth's surface and atmosphere in the microwave range (Distsantsionnye metody izucheniia zemnoi poverkhnosti i atmosfery zemli v SVCh diapazone radiovoln). N. A. Armand (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki, Moscow, USSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 95-105. 6 refs. In Russian.

The application of active and passive radar sensing methods are demonstrated by examples of spaceborne remote sensing of the earth's surface and atmosphere. The theoretical principles of active and passive sensing are described, and some experimental results are presented. The promise of microwave radiometers, scatterometers, and altimeters for oceanography, meteorology, and environmental control is indicated. B.J.

A80-39861 # The spectral reflectance characteristics of natural objects and their application in the remote sensing of the earth (Spektral'nye otrazhatel'nye kharakteristiki prirodnykh obrazovani i ikh primeneniie dlia tselei distantsionnogo issledovaniia zemli). D. N. Mishev (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia po Kosmicheski Izsledvaniia, Sofia, Bulgaria). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 106-113. 17 refs. In Russian.

A series of spectrometers has been developed at the Space Research Laboratory of the Bulgarian Academy of Sciences for the remote measurement of the spectral reflectance of the earth's surface. The principles of operation of these devices are reviewed, and their application for the classification and identification of objects on the earth's surface is examined. B.J.

A80-39863 # Further development of methods for the observation of the earth from space (O dal'neishem razvitiit metodov issledovaniia zemli iz kosmosa). Ia. L. Ziman (Akademiia Nauk SSSR, Institut Kosmicheskikh Issledovani, Moscow, USSR). *Issledovanie Zemli iz Kosmosa*, Jan.-Feb. 1980, p. 125-133. 5 refs. In Russian.

The comprehensive remote sensing program of the Space Research Institute of the USSR Academy of Sciences is described; methodological principles are discussed along with the design and operation of onboard instrumentation. The instrumentation includes a unified video-spectrometry system for both aircraft and satellites, and a new type of system for surveys in several spatial frequency bands. B.J.

A80-40698 # Optimal calibration of remote sensors from results of direct measurements in the ocean (Optimal'naia kalibrovka distantsionnykh priborov po rezul'tatam neposredstvennykh izmerenii v okeane). S. V. Dotsenko and L. G. Salivon (Akademiia Nauk Ukrainskoi SSR, Institut Morskoi Gidrofizicheskii Institut, Sevastopol, Ukrainian SSR). *Meteorologiya i Gidrologiya*, Apr. 1980, p. 107-112. 9 refs. In Russian.

The paper describes a method for the optimal calibration of oceanographic remote sensors from direct measurement sensors. It is shown that the relative calibration error can be reduced considerably if the direct measurements are time-averaged with a certain optimal weight. The application of the technique to satellite (TIROS and Cosmos-149) radiometer measurements is considered as an example. B.J.

A80-41298 # Evaluation of the information properties of space-photography materials and equipment (Voprosy otsenki informatsionnykh svoistv materialov i sredstv kosmicheskoi fotos'emki). L. M. Matiasevich (Gosudarstvennyi Nauchno-Issledovatel'skii i Proizvodstvennyi Tsentri Priroda, USSR). *Issledovanie Zemli iz Kosmosa*, Mar.-Apr. 1980, p. 84-91. 16 refs. In Russian.

Information theory is applied to the evaluation of the characteristics of spaceborne photographic remote sensing systems. The evaluation involves three stages: (1) the selection of information criteria, (2) the development of methods for determining the numerical values of criteria, and (3) the development methods for solving engineering problems on the basis of the selected criteria. B.J.

A80-41540 * Solar occultation sounding of pressure and temperature using narrowband radiometers. J. H. Park, J. M. Russell, III (NASA, Langley Research Center, Hampton, Va.), and M. A. H. Smith (College of William and Mary, Williamsburg, Va.). *Applied Optics*, vol. 19, July 1, 1980, p. 2132-2139. 11 refs. Grant No. NCC1-3.

A technique for simultaneously retrieving pressure and temperature profiles using satellite-based narrowband radiometer measurements of absorption in the CO₂ 4.3-micron band is described. Pressure and temperature profiles for earth's upper atmosphere on a global scale can be obtained with errors less than 3% and 3 K, respectively. The p-T information can be used not only for improving the accuracy of inverted gas concentrations in the same absorption experiment but also for investigating the upper atmosphere circulation. (Author)

A80-41541 * Surface reflectance measurements in the UV from an airborne platform. I. D. Doda and A. E. S. Green (Florida, University, Gainesville, Fla.). *Applied Optics*, vol. 19, July 1, 1980, p. 2140-2145. 29 refs. Contract No. NAS5-22980.

The reflectance of naturally occurring surfaces is measured from a twin engine Cessna 402B aircraft both spectrally (0.29-0.40 micron) with a compact double monochromator and broadband (0.29-1.2 micron) with a UV enhanced photodiode. The measurement system, which is computer controlled and electrically isolated from the aircraft, consists of upward and downward looking hemispheric diffusers, filters, a rotating 90 deg mirror, a focusing lens, and a double monochromator/PMT or the UV photodiode. Measurements are taken at several altitudes enabling the empirical determination of backscatter and attenuation effects on the reflectance. The results are presented for pine forest canopy, green farmland, open ocean, and brown farmland as a function of wavelength and altitude. (Author)

A80-41765 # MOMS - The modular opto-electronic multi-spectral scanner programme development. A. von Breitenstein (Messerschmitt-Bölkow-Block GmbH, Ottobrunn, West Germany). *Deutsche Gesellschaft für Luft- und Raumfahrt und American Astronautical Society, Symposium on Shuttle/Spacelab - The New Transportation System and its Utilization, 3rd, Hanover, West Germany, Apr. 28-30, 1980, DGLR Paper 80-092*. 14 p. 12 refs.

The development of the Modular Optoelectronic Multispectral System (MOMS) electronic camera is discussed, which offers remotely sensed line-by-line scanning of land and coastal/ocean features. The basic MOMS system is designed for an instantaneous field of view of 67.5 microrad, and at an orbit altitude of 296 km, the ground pixel size will be 20 m. Attention is given to the future

development of a MOMS STEREO MODUL with stereoscopic capability, the development of MOMS spectral modules in the infrared range and the extension of the MOMS central control electronics for data compression and reduction. J.P.B.

A80-42065 * # An initial assessment of the performance achieved by the Seasat-1 radar altimeter. W. F. Townsend (NASA, Wallops Flight Center, Wallops Island, Va.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 80-92. 18 refs.

This paper describes the results of an initial on-orbit engineering assessment of the performance achieved by the radar altimeter system flown on Seasat-1. Additionally, the general design characteristics of this system are discussed and illustrations of altimeter data products are provided. The instrument consists of a 13.5-GHz monostatic radar system that tracks in range only using a 1-m parabolic antenna pointed at the satellite nadir. Two of its unique features are a linear FM transmitter with 320-MHz bandwidth, which yields a 3.125-ns time-delay resolution, and microprocessor-implemented closed-loop range tracking, automatic gain control (AGC), and real-time estimation of significant wave height (SWH). Results presented herein show that the altimeter generally performed in accordance with its original performance requirements of measuring altitude to a precision of less than 10-cm rms, SWH to an accuracy of plus or minus 0.5 m or 10 percent whichever is greater, and ocean backscatter coefficient to an accuracy of plus or minus 1 dB, all over an SWH range of 1 to 20 m. (Author)

A80-42066 * Seasat altimeter sensor file algorithms. D. W. Hancock, R. G. Forsythe (NASA, Wallops Flight Center, Wallops Island, Va.), and J. Lorell (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 93-99. 8 refs. Contract No. NAS7-100.

The Seasat altimeter is designed to measure three parameters important to oceanography: height of the spacecraft above the ocean surface, significant wave height, and ocean backscatter coefficient from which surface winds may be inferred. Since the measurement process is indirect, and the measurement environment is complicated by many factors affecting the instrument readings, corrections to the raw data are needed before they are used to compute geophysical parameters. These corrections are accomplished by the Seasat altimeter sensor file algorithms. The purpose of this paper is to describe these algorithms, why they are needed, how they are implemented, and the evaluation using in-flight data. (Author)

A80-42067 * The Seasat scanning multichannel microwave radiometer /SMMR/ - Instrument description and performance. E. G. Njoku, J. M. Stacey, and F. T. Barath (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 100-115. 18 refs. Contract No. NAS7-100.

The scanning multichannel microwave radiometer (SMMR) is an imaging 5-frequency radiometer flown on the Seasat and Nimbus-7 earth satellites launched in 1978. It measures dual-polarized microwave radiances from the earth's atmosphere and surface, primarily for the purpose of deriving global and nearly all-weather measurements of sea surface temperature, wind speed, and atmospheric liquid water and water vapor. This paper describes the SMMR instrument and its calibration, antenna pattern measurements, and data processing procedures. Analysis of early data from the Seasat SMMR shows that the expected engineering performance in flight was achieved, and the measurement of sea surface temperature and wind speed with accuracies of 1.5 K and 2 m/s, respectively, may be achievable once the geophysical data processing algorithms and analysis have been completed. (Author)

A80-42068 * The Seasat scanning multichannel microwave radiometer /SMMR/ - Radiometric calibration algorithm development and performance. P. N. Swanson and A. L. Riley (California Institute of Technology, Jet Propulsion Laboratory, Pasadena,

Calif.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 116-124. Contract No. NAS7-100.

Radiometric calibration algorithms for processing Seasat scanning multichannel microwave radiometer (SMMR) flight data are presented. An equation is derived which accounts for losses and reradiation in the microwave components and nonlinearities in the radiometer. The application of pre-launch calibration data to this derivation is described. A performance evaluation of the post-launch operation of the algorithm is presented, indicating temperature resolution of 0.63 K at 6.6 GHz and 1.39 K at 37 GHz. (Author)

A80-42069 * The Seasat scanning multichannel microwave radiometer /SMMR/: Antenna pattern corrections - Development and implementation. E. G. Njoku, E. J. Christensen, and R. E. Cofield (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 125-137. 17 refs. Contract No. NAS7-100.

The antenna temperatures measured by the Seasat scanning multichannel microwave radiometer (SMMR) differ from the true brightness temperatures of the observed scene due to antenna pattern effects, principally from antenna sidelobe contributions and cross-polarization coupling. To provide accurate brightness temperatures convenient for geophysical parameter retrievals the antenna temperatures are processed through a series of stages, collectively known as the antenna pattern correction (APC) algorithm. A description of the development and implementation of the APC algorithm is given, along with an error analysis of the resulting brightness temperatures. (Author)

A80-42070 * # Seasat-A satellite scatterometer instrument evaluation. J. W. Johnson, L. A. Williams, Jr., E. M. Bracalente, F. B. Beck, and W. L. Grantham (NASA, Langley Research Center, Hampton, Va.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 138-144. 12 refs.

The Seasat-A satellite scatterometer (SASS) was designed to measure ocean surface wind speed and direction in twenty-four independent cells over a 1000-km swath. It operated in the interrupted CW mode at a frequency of 14.6 GHz with four fan beam antennas and used Doppler filtering in the receiver for resolving the cells on the surface. The instrument began operating in space on July 6, 1978, and gathered normalized radar cross section data for approximately 2290 h. The purpose of this paper is to describe the in-orbit evaluation of the SASS hardware and its compatibility with the spacecraft. It has been determined that the scatterometer operated flawlessly throughout the mission, met all design requirements, and established a good data base for geophysical processing. (Author)

A80-42071 * The SASS scattering coefficient algorithm. E. M. Bracalente, W. L. Grantham (NASA, Langley Research Center, Hampton, Va.), D. H. Boggs (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), and J. L. Sweet (Kentrion International, Inc., Hampton, Va.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 145-154. 12 refs. Contract No. NAS7-100.

This paper describes the algorithms used to convert engineering unit data obtained from the Seasat-A satellite scatterometer (SASS) to radar scattering coefficients and associated supporting parameters. A description is given of the instrument receiver and related processing used by the scatterometer to measure signal power backscattered from the earth's surface. The applicable radar equation used for determining scattering coefficient is derived. Sample results of SASS data processed through current algorithm development facility (ADF) scattering coefficient algorithms are presented which include scattering coefficient values for both water and land surfaces. Scattering coefficient signatures for these two surface types are seen to have distinctly different characteristics. Scattering coefficient measurements of the Amazon rain forest indicate the usefulness of this type of data as a stable calibration reference target. (Author)

08 INSTRUMENTATION AND SENSORS

A80-42072 * The Seasat-A synthetic aperture radar system. R. L. Jordan (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *IEEE Journal of Oceanic Engineering*, vol. OE-5, Apr. 1980, p. 154-164. Contract No. NAS7-100.

The paper discusses the Seasat-A synthetic aperture radar system (SAR). The objective of this system was to detect ocean waves from orbital altitudes. A SAR system operating at 1275 MHz was designed to meet this objective; the choice of wavelength resulted from the imagery obtained by aircraft during 1972 to 1974 and the ease of implementation. The Seasat-A SAR system was turned-on in orbit on July 4, 1978, and gathered imagery until the spacecraft bus failed in orbit in Oct. 1978. The hardware including the antenna, the radar sensor, and data-link subsystem, and the SAR data processing subsystem are described; the radar performance including the SAR system error budget and various SAR imageries are presented, concluding that the performance of the Seasat-A SAR system met all of its parameters on at least some of the imagery. A.T.

A80-43809 # Aperture synthesis with respect to microwave signals reflected from the sea surface (Sintezirovaniye iskusstvennoi apertury po SVCh-radiosignalam, otrazhennym ot morskoi poverkhnosti). B. S. Mush. *Radiotekhnika i Elektronika*, vol. 25, July 1980, p. 1426-1433. 9 refs. In Russian.

The theory of using synthetic-aperture radar to obtain images of the reflecting sea surface is examined. A formula is presented for calculating a reflecting-surface function which is a linear superposition of simple waves and those obtained by means of synthetic-aperture radar echo signals. These formulas lead to recommendations on the design of experiments aimed at investigating the properties of the sea surface. Experimental results are presented which confirm the theoretical calculations. B.J.

N80-22757# National Environmental Satellite Center, Washington, D. C.

FUTURE UNITED STATES SATELLITE PROGRAMS OF INTEREST TO SNOW SCIENTISTS

Donald R. Wiesnet 1979 7 p
Avail: NTIS HC A02/MF A01

Orbital parameters and sensor characteristics are described for the Heat Capacity Mapping Mission, LANDSAT C, Seasat A, Nimbus G, and the Tiros N satellites. Implications for snow studies using the new and improved sensors are discussed. A.R.H.

N80-22758*# Computer Sciences Corp., Wallops Island, Va. DETERMINING SEA-ICE BOUNDARIES AND ICE ROUGHNESS USING GEOS-3 ALTIMETER DATA

R. E. Dwyer and R. H. Godin (NOAA, Washington, D. C.) Wallops Island, Va. NASA Wallops Flight Center. Mar. 1980 49 p refs
(NASA-CR-156862) Avail: NTIS HC A03/MF A01 CSCL 08L

The GEOS-3 satellite and radar altimeter instrumentation are described, detailing the ice boundary discrimination technique utilized and presenting an analyses of the GEOS-3 data with respect to satellite visual and IR imagery. A brief description of the GEOS-3 real time data system is also given. E.D.K.

N80-22759*# National Aeronautics and Space Administration, Washington, D. C.

PROGRAM FOR INTEGRATING MULTIZONAL PHOTOGRAPHS OF THE EARTH, TAKEN BY MKF-6 CAMERA, IN A COMPUTER

A. V. Agapov and S. T. Mosin Jan. 1980 14 p Transl. into ENGLISH of "Programma Sovmeshcheniya v EVM Mnogozonalnykh Fotosnimkov Zemli, Poluchennykh Fotokamerami MKF-6". Rept. Pr-323 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1977 p 1-13 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Acad. of Sci. USSR, Kolosov (Contract NASw-3199)
(NASA-TM-75701: Pr-323) Avail: NTIS HC A02/MF A01 CSCL 14E

An algorithm and program are described, for integrating up to 6 simultaneously exposed photographs in different spectral ranges of the surface of the Earth, taken by MKF-6 cameras aboard Soyuz-22. Three of the reference marks are identified on 1 photograph and then are used to integrate the other photographs with the first. The program was compiled for the ES-1040 computer, as a standard subprogram in a system for computer processing of data of study of the Earth from space.

Author

N80-23733*# Department of Agriculture, Weslaco, Tex. Science and Education Administration.

PLANT COVER, SOIL TEMPERATURE, FREEZE, WATER STRESS, AND EVAPOTRANSPIRATION CONDITIONS Quarterly Progress Report, 1 Dec. 1979 - 1 Mar. 1980

Craig L. Wiegand, Paul R. Nixon, Harold W. Gausman, L. Neal Namken, Ross W. Leamer, and Arthur J. Richardson, Principal Investigators Mar. 1980 9 p HCMM
(Contract NASA Order S-40198-B)
(E80-10106: NASA-CR-162817) Avail: NTIS HC A02/MF A01 CSCL 08B

The author has identified the following significant results. HCMM day/night coverage 12 hours apart cannot be obtained at 26 deg N latitude; nor have any pairs 36 hours apart been obtained. A day-IR scene and a night scene for two different dates were analyzed. A profile across the test site for the same latitude shows that the two profiles are near mirror images of each other over land surfaces and that the temperature of two large water bodies, Falcon Reservoir and the Gulf of Mexico, are nearly identical on two dates. During the time interval between overpasses, the vegetative cover remained static due to winter dormancy. The data suggest that day/night temperature differences measured weeks apart may yield meaningful information about the contrast between daytime maximum and nighttime minimum temperatures for a given site.

N80-23734*# Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).

APPLICATION EXPLORER MISSION A: HEAT CAPACITY MAPPING MISSION

R. Haydn, Principal Investigator [1979] 3 p Sponsored by NASA HCMM
(E80-10107: NASA-CR-162818) Avail: NTIS HC A02/MF A01 CSCL 08B

N80-25762*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

AN ALTERNATE ALGORITHM FOR CORRECTION OF THE SCANNING MULTICHANNEL MICROWAVE RADIOMETER POLARIZATION RADIANCES USING NIMBUS-7 OBSERVED DATA

Per Gloersen, D. J. Cavalieri, and Harold V. Soule (OAO Corp., Beltsville, Md.) Apr. 1980 27 p refs Submitted for publication
(NASA-TM-80672) Avail: NTIS HC A03/MF A01 CSCL 14B

The manner in which Nimbus-7 scanning multichannel microwave radiometer (SMMR) scan radiance data was used to determine its operational characteristics is described. The predicted SMMR scan radiance was found to be in disagreement at all wavelengths with a large area of average measured ocean radiances. A modified model incorporating a different phase shift for each of the SMMR horizontal and vertical polarization channels was developed and found to provide good data correlation. Additional study is required to determine the validity and accuracy of this model. A.R.H.

N80-25771# National Technical Information Service, Springfield, Va.

INSTRUMENTATION AND DATA PROCESSING USED IN EARTH RESOURCES TECHNOLOGY SATELLITES (ERTS), VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - 1979

Audrey S. Hundemann Mar. 1980 244 p Supersedes NTIS/PS-79/0206; NTIS/PS-78/0070; NTIS/PS-77/0081 (PB80-805740; NTIS/PS-79/0206; NTIS/PS-78/0070; NTIS/PS-77/0081) Avail: NTIS HC \$30.00/MF \$30.00 CSCL 14B

Abstracts are cited dealing with new or improved remote sensing techniques. Topic areas cover pattern recognition, spectrum analysis, image enhancement, photointerpretation, multispectral photography, and mapping. This updated bibliography contains 237 abstracts, 35 of which are new entries to the previous edition. GRA

N80-25772# National Environmental Satellite Service, Washington, D. C.

DATA EXTRACTION AND CALIBRATION OF TIROS-N/NOAA RADIOMETERS

Levin Lauritson, Gary J. Nelson, and Frank W. Porto Nov. 1979 80 p refs (PB80-150824; NOAA-TM-NESS-107; NOAA-80010909) Avail: NTIS HC A05/MF A01 CSCL 22A

The TIROS N/NOAA series is the third generation of environmental satellites providing real-time data to direct readout users. Information is presented that enables users to extract from the telemetry streams data that are unique to a given sensor, to calibrate these data, and to develop an understanding of the accuracy and precision that can be expected of the calibrated data. GRA

N80-26714*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

A METHODOLOGY FOR DETERMINING OPTIMUM MICROWAVE REMOTE SENSOR PARAMETERS

J. C. Holtzman, Principal Investigator and V. H. Kaupp Feb. 1980 200 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57918 ERTS (Contract NAS9-15602) (E80-10124; NASA-CR-160564; RSL-TR-380-1) Avail: NTIS HC A09/MF A01 CSCL 14B

N80-26774*# Toledo Univ., Ohio.
NONLINEAR AEROELASTIC EQUATIONS OF MOTION OF TWISTED, NONUNIFORM, FLEXIBLE HORIZONTAL-AXIS WIND TURBINE BLADES Final Report

Krishna Rao V. Kaza Jul. 1980 70 p refs (Grant NSG-3139; Contract EX-76-1-01-1028) (NASA-CR-159502; DOE/NASA/3139-1) Avail: NTIS HC A04/MF A01 CSCL 10A

The second-degree nonlinear equations of motion for a flexible, twisted, nonuniform, horizontal axis wind turbine blade were developed using Hamilton's principle. A mathematical ordering scheme which was consistent with the assumption of a slender beam was used to discard some higher-order elastic and inertial terms in the second-degree nonlinear equations. The blade aerodynamic loading which was employed accounted for both wind shear and tower shadow and was obtained from strip theory based on a quasi-steady approximation of two-dimensional, incompressible, unsteady, airfoil theory. The resulting equations had periodic coefficients and were suitable for determining the aeroelastic stability and response of large horizontal-axis wind turbine blades. R.E.S.

N80-26775*# Boeing Engineering and Construction, Seattle, Wash.

MOD-2 WIND TURBINE SYSTEM CONCEPT AND PRELIMINARY DESIGN REPORT. VOLUME 2: DETAILED REPORT

Jul. 1979 269 p (Contracts DEN3-2; DE-A101-793T-20305) (NASA-CR-159609; DOE/NASA-0002-80/2) Avail: NTIS HC A12/MF A01 CSCL 10A

The configuration development of the MOD-2 wind turbine system (WTS) is documented. The MOD-2 WTS project is a continuation of DOE programs to develop and achieve early commercialization of wind energy. The MOD-2 is design optimized for commercial production rates which, in multiunit installations, will be integrated into a utility power grid and achieve a cost of electricity at less than four cents per kilowatt hour. J.M.S.

N80-27779*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

SNOWPACK MONITORING IN NORTH AMERICA AND EURASIA USING PASSIVE MICROWAVE SATELLITE DATA

J. L. Foster, A. Rango, and D. K. Hall [1980] 23 p refs Submitted for publication (NASA-TM-80706) Avail: NTIS HC A02/MF A01 CSCL 08L

Areas of the Canadian high plains, the Montana and North Dakota high plains, and the steppes of central Russia were studied in an effort to determine the utility of spaceborne electrical scanning microwave radiometers (ESMR) for monitoring snow depths in different geographic areas. Significant regression relationships between snow depth and microwave brightness temperatures were developed for each of these homogeneous areas. In the areas investigated, Nimbus 6 (.081 cm) ESMR data produced higher correlations than Nimbus 5 (1.55 cm) ESMR data in relating microwave brightness temperature and snow depth from one area to another because different geographic areas are likely to have different snowpack conditions. L.F.M.

N80-27781*# National Aeronautics and Space Administration, Washington, D. C.

THE HIGH VISIBLE RESOLUTION (HVR) INSTRUMENT OF THE SPOT GROUND OBSERVATION SATELLITE

G. Otrio Apr. 1980 22 p Transl. into ENGLISH of conf. paper "L'Instrument a Haute Resolution Visible (HRV) du Satellite d'Observation de la Terre: Spot", Rept. IAF-79-F-239 Intern. Astronautical Federation, Munich, Sep. 1979 p 1-13 Presented at 30th Intern. Astronautical Federation, Munich, Sep. 1979 Original language document was announced as A79-53369 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Natl. Space Studies Center, Toulouse (Contract NASW-3199) (NASA-TM-75830; IAF-79-F-239) Avail: NTIS HC A02/MF A01 CSCL 20F

Two identical high resolution cameras, capable of attaining a track width of 116 km in an almost vertical line of sight from the two 60 km images of each instrument, will be carried on the initial mission of the space observation of Earth satellite (SPOT). Specifications for the instrument, including the telescope and CCD devices are summarized. The present status of development is described including the optical characteristics, structure and thermal control, detector assembly, electronic equipment, and calibration. SPOT mission objectives include the developments relating to soil use, the exploration of EART Earth resources, the discrimination of plant species, and cartography. A.R.H.

N80-27873*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Dept. of Space.

ASSESSMENT OF ATMOSPHERIC HEIGHT UNCERTAINTIES FOR HIGH PRECISION SATELLITE ALTIMETER MISSIONS TO MONITOR OCEAN CURRENTS

Julius Goldhirsh and John R. Rowland Jun. 1980 73 p refs (Contract NASA Order P-78192; Contract N00024-78-C-5384) (NASA-CR-156868; JHU/APL-SIR80U-018) Avail: NTIS HC A04/MF A01 CSCL 04A

The influence of the atmosphere on nadir directed signal associated with satellite altimeters are examined. Frequencies at 6, 13.5, and 35 GHz are selected so as to provide a parameter study. Uncertainties are summarized in both existing and proposed techniques which establish ionospheric and tropospheric height corrections. The error summary thus gives values describing the best you can do in height resolution (as dictated by atmospheric parameters) for a satellite borne altimeter system. The results

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presented reflect data gleaned from the literature, at large, as well as from the existing body of published literature associated with the Seasat A Altimeter Experiment. Specifically considered are: (1) the effects of precipitation on altimeter signals, (2) range errors due to refractive index variations in both the clear atmosphere (convective and nonconvective) and clouds, and (3) range errors introduced by the ionosphere. A preliminary analysis is pursued establishing the feasibility of incorporating rain rate range gates in a future satellite-borne altimeter system. F.O.S.

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Includes economic analysis.

A80-34523 Thorny questions over remote sensing. S. Yanchinski. *New Scientist*, vol. 86, Apr. 17, 1980, p. 150-152.

Consideration is given to problems associated with the use and reception of expensive remote sensing data by developing nations. Questions of access to sensitive information acquired by satellite, the costs involved in installing, operating and maintaining satellite ground stations by nations desiring exclusive information, the training of remote sensing interpreters in developing nations, the true value of Landsat data in resource evaluation and other applications, the use of regional ground receiving stations, costs associated with the updating of ground facilities and the present incompatibility of Landsat systems with the French SPOT remote sensing satellite are discussed. It is suggested that the best solution may prove to be the launching of additional remote sensing satellites by the wealthier or more advanced of the developing nations. A.L.W.

A80-34527 # Remote sensing activities in the Netherlands (Remote sensing activiteiten in Nederland). R. van Konijnenburg (Rijkswaterstaat, Meetkundige Dienst, Netherlands). *Ruimtevaart*, vol. 29, Feb. 1980, p. 9-14. In Dutch.

The Netherlands remote sensing technology applications program (NIWARS) is described. Attention is given to the development of sensors (SLAR, IR scanners, etc.), and to the participation of various Netherlands organizations in the remote sensing effort. B.J.

A80-34528 # The possibility of using a Netherlands remote sensing satellite for the needs of developing countries (Toepassingsmogelijkheden van een Nederlandse remote sensing satelliet ten behoeve van de ontwikkelingslanden). A. Rosema and J. H. Bijleveld (Engineering Consultants Environmental Analysis and Remote Sensing, Delft, Netherlands). *Ruimtevaart*, vol. 29, Feb. 1980, p. 15-23. In Dutch.

A80-36319 # Earth observation - Issues and perspectives /The Theodore von Karman Lecture/. D. J. Fink (General Electric Co., Fairfield, Conn.). *American Institute of Aeronautics and Astronautics, International Meeting and Technical Display on Global Technology 2000*, Baltimore, Md., May 6-8, 1980, Paper 80-0930. 56 p. 32 refs.

The acquisition, transmission, processing and dissemination of earth observation data from space platforms are analyzed, and the potential of space-borne earth observation is assessed. Following a brief review of the historical development of earth observation from airborne, rocket and space platforms using cameras and other sensors, the significant programs which influenced the direction and progress of space technology for earth observation are considered, including the TIROS, Gemini and Landsat programs. Applications of space-borne cloud and land imagery, ground receiving stations, and geostationary platforms in oceanography, meteorology, climate studies, magnetic sensing and land observation are illustrated with photographs, and the various users of this information are indicated. The systems and technology involved in earth observation from space are analyzed, with attention given to system design to meet mission and user requirements, sensing, communications, data processing and information extraction technology, and future system trends. Perspectives are presented on the achievements of earth observation programs, and cost-benefit, technical and institutional issues limiting the advance of earth observation applications are identified. A.L.W.

A80-36964 # Shuttle era opportunities in earth resources rationalization. C. T. N. Paludan (Tennessee, University, Tullahoma,

Tenn.). In: *Shuttle to the next space age; Proceedings of the Southeast Seminar for Reporters and Teachers*, Huntsville, Ala., July 18, 19, 1979. New York, American Institute of Aeronautics and Astronautics, Inc., 1979, p. 57-61. 9 refs. (AIAA 79-3071)

Remote sensing results have already proven useful in rationalizing the utilization of scarce resources. The stage is now set for international cooperation in the management of the world's resources. The Space Transportation System will play an important role in getting instruments and communications items into orbit; the Shuttle provides an opportunity for the use of large complex instruments, including the Large Format Camera and the Shuttle Imaging Radar. B.J.

A80-38207 # Landsat D: Case study in spacecraft design. B. T. Bachofer (General Electric Co., Space Div., Philadelphia, Pa.). New York, American Institute of Aeronautics and Astronautics, Inc., 1979. 171 p. \$12.50.

The Landsat D project is intended to apply remotely sensed data from space to the management of the earth's resources, utilizing the thematic mapper, a seven spectral band, mechanically scanned radiometer with 30-m spatial resolution. The flight system design of Landsat D is discussed in detail, with attention given to thermal control and flight software. In addition, communication design is considered, including wideband and narrowband communication subsystems and antenna and transmitter power levels, as well as the electrical system design, including solar array size, battery selection, power distribution and protection, and command and telemetry distribution. J.P.B.

A80-38786 Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings (Applicazioni del telerilevamento dallo spazio; Convegno Scientifico Internazionale sullo Spazio, 20th, Rome, Italy, March 11-13, 1980, Atti). Conference sponsored by the Ministero degli Affari Esteri, ESA, Associazione Industrie Aerospaziali, et al. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980. 425 p. In Italian, English, and French.

Applications of spaceborne remote sensing and ranging systems are discussed in terms of orbiting systems, and the reception, processing and utilization of data; technical and economic aspects are also addressed. Topics include the operation of the microwave remote sensing experiment, the lidar air transport system for geophysical and atmospheric experiments, and applications of remote sensing in the agricultural field. Also presented are a mathematical model for thermal inertia mapping by infrared imagery, the determination of chlorophyll concentration in the sea from the Nimbus-7 coastal zone color scanner, the measurement of evapotranspiration by means of surface temperature, and electronic photointerpretation using digital processing for applications in structural geology. J.P.B.

A80-38787 # The earth observation programme of the European Space Agency. M. Trella and J. Louet (ESA, Paris, France). In: *Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings*. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1980, p. 13-37.

The activities of the European Space Agency with regard to earth observation from space are summarized. Attention is given to missions for the next decade, including a meteorological program concerned mainly with setting up an operational service provided by a series of Meteosat satellites. Also considered are a European remote sensing program for the monitoring and analysis of land, coastal, ocean and polar regions, and an earth-oriented science program on climatology and geodynamics-geodesy. Data processing and dissemi-

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nation are also discussed, along with platforms for the collection of in situ data. J.P.B.

A80-38806 # The Earthnet program - Experiences and prospects (Il programma Earthnet - Esperienze e prospettive). L. Marelli (ESA, Frascati, Italy). In: Applications of remote sensing and ranging systems from space; International Scientific Conference on Space, 20th, Rome, Italy, March 11-13, 1980, Proceedings. (A80-38786 16-43) Rome, Rassegna Internazionale Elettronica Nucleare ed Aero-spaziale, 1980, p. 261-270. In Italian.

The operation of Earthnet's receiving and preprocessing facilities is summarized. The program consists of S-band stations throughout Europe and utilizes the optical processing of synthetic aperture radar data; standard digital and photographic products are used. Attention is given to the acquisition function and the problem of archiving remotely sensed data, the preprocessing function, considering geometric and radiometric system corrections, the distribution function, and the evolution of the use of the remotely sensed data. J.P.B.

A80-39742 The ESA remote sensing programme. J. Plevin (ESA, Directorate of Planning and Future Programmes, Paris, France) and C. Honvault (ESA, Directorate of Applications Programmes, Toulouse, France). *International Journal of Remote Sensing*, vol. 1, Jan.-Mar. 1980, p. 53-67. 7 refs.

The major European activities in the field of spaceborne remote sensing are outlined. The overall objectives of European remote sensing satellite systems are indicated, and the Earthnet satellite remote sensing data network is outlined. Attention is given to the Metric Camera and Microwave Remote Sensing Experiment to be flown aboard the first Spacelab mission, and to system feasibility studies and development activities for a satellite-borne SAR and the Land Application Satellite System and the Coastal Ocean Monitoring Satellite System. The importance of developing applications demonstrations is considered. It is concluded that remote sensing satellites will form an important part of the future ESA space program, with implementation by the mid-1980s. A.L.W.

A80-40464 Isro - India's ambitious space agency. D. Velupillai. *Flight International*, vol. 117, June 28, 1980, p. 1466-1470.

India's space program is described in terms of developments in communications as well as earth observation for natural resources management. Attention is given to the SLV-3 orbital launcher and the flight-test instrumentation payload. The Ariane passenger payload experiment which is to be launched from India as a test communications satellite is also described. Emphasis is placed on the combined communications and meteorological satellite system, Insat. J.P.B.

A80-41290 # The structure of a space system for the sensing of earth resources (Struktura kosmicheskoi sistemy izucheniia prirodnikh resursov zemli). Iu. P. Kienko (Gosudarstvennyi Nauchno-Issledovatel'skii i Proizvodstvennyi Tsentr Priroda, USSR). *Issledovanie Zemli iz Kosmosa*, Mar.-Apr. 1980, p. 5-10. In Russian.

A Soviet system for the remote sensing of earth resources is discussed. The system incorporates Salyut orbital stations, Cosmos satellites, Meteor satellites, AN-30 airborne laboratories, test sites, and data processing systems. B.J.

A80-41299 # Remote sensing activities in France (Raboty po distantsionnomu zondirovaniu vo Frantsii). A. Iu. Kholmovskii. *Issledovanie Zemli iz Kosmosa*, Mar.-Apr. 1980, p. 92-102. 16 refs. In Russian.

The remote sensing program of France can be divided into two parts: (1) that based on Landsat and (2) aerial thermographic and multispectral surveys conducted without foreign assistance. This paper reviews the French remote sensing program with attention given to sensor systems and image processing techniques. Various

specific projects are briefly discussed, including FRALIT, ARNICA, PYRALP, GOLION, POLUMER, and AGREST. B.J.

A80-41301 Remote sensing of earth resources. Volume 7 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1978, Technical Papers. Edited by F. Shahrokhi (Tennessee, University, Tullahoma, Tenn.). Tullahoma, Tenn., University of Tennessee, 1980. 348 p.

The latest advances in the field of remote sensing of earth resources are discussed with particular reference to problems involving computer-controlled and manual systems for interpreting multi-spectral photography and scanner data as well as sensor technology, information applications and data flow schemes. Papers are presented on low-cost image displays using computer graphics techniques, forest cover mapping from Landsat imagery, application of remote sensing to estimating soil erosion potential, and determination of the properties of a powerplant plume by aircraft and spacecraft measurements. V.L.

A80-41662 Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Edited by F. Shahrokhi and T. Paludan (Tennessee, University, Tullahoma, Tenn.). Tullahoma, Tenn., University of Tennessee, 1980. 379 p.

Topical problems involving computer-controlled and manual systems for interpreting multispectral photography, and scanner data are discussed along with sensor technology, information applications, and data flow schemes. Particular consideration is given to site-specific mapping of surface temperature based on NOAA-5 satellite VHRR data, digital resampling of Landsat forest imagery for multitemp registration, estimation of vegetation biomass in bunchgrass rangelands of Alberta using Landsat imagery, and the applicability of Landsat imagery for mapping soils in arid and semiarid regions. B.J.

A80-41663 * Technology transfer of remote sensing technology. A. D. Smith (NASA, Marshall Space Flight Center, Huntsville, Ala.). In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers.

Tullahoma, Tenn., University of Tennessee, 1980, p. 1-8.

The basic philosophy and some current activities of MSFC Technology Transfer with regard to remote sensing technology are briefly reviewed. Among the problems that may be alleviated through such technology transfer are the scarcity of energy and mineral resources, the alteration of the environment by man, unpredictable natural disasters, and the effect of unanticipated climatic change on agricultural productivity. B.J.

A80-41681 End-to-end data/information system concept - The solution or the problem. C. E. Catoe. In: Remote sensing of earth resources. Volume 8 - Annual Remote Sensing of Earth Resources Conference, 7th, Tullahoma, Tenn., March 27-29, 1979, Technical Papers. Tullahoma, Tenn., University of Tennessee, 1980, p. 323-372. 67 refs.

In order to alleviate the data management problems associated with the efficient and cost-effective handling of information, NASA is embarking on the development of a total end-to-end information system, which will involve everything from the sensing of an event to the processing and information and its delivery to the user. In this paper the various elements that make up the total end-to-end system are examined in order to determine how they interrelate and how they impact the operational needs of the user community. It is noted that the major current limitation to the successful implementation of the end-to-end system concept is the uneven readiness of the system elements. B.J.

A80-42859 Earth observation - Cooperative mission or competitive venture. L. Warzecha (General Electric Co., Space Div., Philadelphia, Pa.). In: Space - New opportunities for international ventures; Proceedings of the Seventeenth Goddard Memorial Symposium, Washington, D.C., March 28-30, 1979. San Diego, Calif., American Astronautical Society; Univelt, Inc., 1980, p. 175-192. (AAS 79-061)

Aspects of international cooperation and competition in earth observation from space are considered. Attention is given to advantages of cooperation, earth observation missions (e.g., meteorological, resource management, oceanographic, environmental, thermal, and geophysical), issues in international remote sensing, technical issues, political issues, economic issues, and courses of possible action. B.J.

A80-43476 * Integrated use of Landsat data for state resource management. W. G. Schneider, Jr. Research supported by NASA; Contract No. NASw-3140. Lexington, Ky., Council of State Governments, 1979. 41 p. 6 refs. \$4.00.

The study deals with the integration of a practical information resource - data from the earth orbiting satellite Landsat - with alternate forms of data to structure a state resource data base. State use of Landsat data within a comprehensive resource management scheme is examined. The efforts of NASA in the transfer of this space technology to state resource management applications are outlined. The role two nongovernmental sectors, universities and private industry, play in assisting states to develop Landsat data analysis capability is described. V.T.

N80-22760*# National Aeronautics and Space Administration, Washington, D. C.

THE SOPHIA-ANTIPOLIS CONFERENCE: GENERAL PRESENTATION AND BASIC DOCUMENTS

Mar. 1980 50 p. Transl. into ENGLISH of conf. paper from CNES, Operation Pilote Interministerielle de Teledetection, Paris Conf. held at Paris, Feb. 1980 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76132) Avail: NTIS HC A03/MF A01 CSCL 05A

The procedures and techniques used in NASA's aerospace technology transfer program are reviewed for consideration in establishing priorities and bases for joint action by technicians and users of remotely sensed data in France. Particular emphasis is given to remote sensing in agriculture, forestry, water resources, environment management, and urban research. A.R.H.

N80-23719*# National Governors Association/Council of State Planning Agencies, Washington, D. C.

EARTH RESOURCES DATA PROJECT Final Report, 1 Aug. - 30 Sep. 1979

Feb. 1980 96 p ERTS

(Contract NASw-3140)

(E80-10092; NASA-CR-162802)

Avail: NTIS

HC A05/MF A01 CSCL 05B

N80-25273# Finnish National Committee of COSPAR, Otaniemi. **SPACE ACTIVITIES IN FINLAND IN 1978 Annual Report**

M. Tiuri, ed. and S. Urpo, ed. 1978 11 p refs Prepared in cooperation with Helsinki Univ. of Technology, Espoo

Avail: NTIS HC A02/MF A01

Finnish space programs completed in 1978 or in progress are reviewed. These include soil mapping, land use mapping, and terrain analysis all from LANDSAT data as well as forest mapping, small scale mapping, and ore prospecting (aircraft scanner data). Finnish involvement in the Intelsat, Eutelsat, Sirio, and OTS satellite programs is also discussed. The work of Finnish satellite tracking, telemetry, and acquisition facilities is covered.

Author (ESA)

N80-27914*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

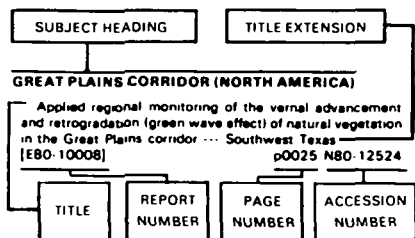
METEOROLOGICAL SATELLITES

Lewis J. Allison, ed., Abraham Schnapf (RCA Corp.), Bernard C. Diesen, III (USAF), Philip S. Martin (USAF), Arthur Schwalb (NOAA), and William R. Bandeen Jun. 1980 78 p refs Submitted for publication

(NASA-TM-80704) Avail: NTIS HC A05/MF A01 CSCL 04B

An overview is presented of the meteorological satellite programs that have been evolving from 1958 to the present, and plans for the future meteorological and environmental satellite systems that are scheduled to be placed into service in the early 1980's are reviewed. The development of the TIROS family of weather satellites, including TIROS, ESSA,ITOS/NOAA, and the present TIROS-N (the third generation operational system) is summarized. The contribution of the Nimbus and ATS technology satellites to the development of the operational-orbiting and geostationary satellites is discussed. Included are descriptions of both the TIROS-N and the DMSP payloads currently under development to assure a continued and orderly growth of these systems into the 1980's. Author

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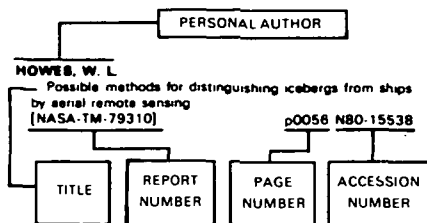
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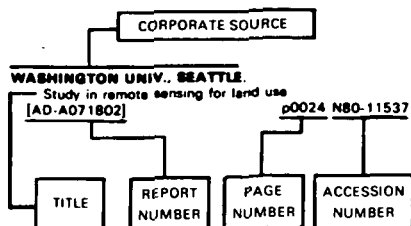
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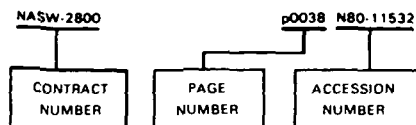
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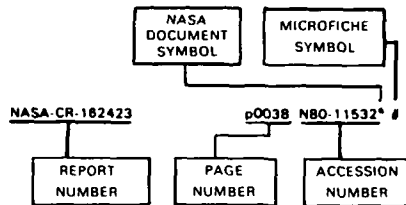
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